Structural Change and Productivity Growth

20 Years Later

Old problems, new opportunities

2008 | Thirty-second session of ECLAC

Santo Domingo, Dominican Republic, 9-13 June 2008

UNITED NATIONS

ECLAC

60 ECLAC

SIXTY YEARS WITH LATIN AMERICA AND THE CARIBBEAN

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Explanatory notes

The following symbols are used in tables in this publication:

Three dots (…) indicate that data are not available or are not separately reported.
A minus sign (-) indicates a deficit or decrease, unless otherwise indicated.
A full stop (.) is used to indicate decimals.
Use of a hyphen (-) between years (e.g., 2001-2003) indicates reference to the complete period considered, including the beginning and end years.
The term "dollars" refers to United States dollars, unless otherwise specified.
Figures and percentages in tables may not necessarily add up to the corresponding totals due to rounding.

Distr. General • LC/G.2367(SES.32/3) • May 2008 • Original: Spanish • © United Nations • Printed in Santiago, Chile

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Introduction

Nearly 20 years ago, ECLAC put forward a proposal for structural change and productivity growth with social equity. At the time, the countries of the region were emerging from the severe crisis of the 1980s, with all its associated difficulties in terms of internal stabilization and external adjustment, and headed into a decade of structural reform which heeded the call of the Washington Consensus. In the midst of perplexity and pessimism regarding the region’s prospects, ECLAC espoused a view of the situation that ran counter to the extremely orthodox line of thought that marked economic policy tenets of the time.

The idée-force underlying this view situated the region within the universe of developing countries and highlighted the deteriorating situation by using the metaphor of an “empty box” to symbolize the difficulties that the region was having in reconciling growth with social equity. This proposal for structural change and productivity growth was thus aimed at promoting economic expansion and social equity, not sequentially, but at one and the same time.

In addressing the issue of economic growth, ECLAC started out by taking stock of the major changes that were then taking place in the world and the way in which they were redefining a recurring theme in its thinking: the generation and propagation of technical progress. It contended that, in order to achieve technical progress and boost productivity, the region’s economies had to become more open, but it also drew a distinction between genuine and spurious competitiveness and emphasized the systemic nature of this phenomenon. At the same time, it maintained that the transition to greater economic openness should be gradual, should place priority on exports, and should be underpinned by a stable competitive real exchange rate. Unfortunately, the way in which the region's economies were opened up during the 1990s exhibited very few traces of these essential components of structural change.

At the same time, given the absence of social equity, it was important to adopt an integrated view of development. This approach departed from unilateral perspectives according to which economic policies and social policies were two completely different and separate spheres of activity which would, nonetheless, naturally tend to balance each other. ECLAC argued that, without the type of growth that would strengthen the demand for skilled labour and create opportunities for small and medium-sized enterprises, it would be very difficult for the region to increase social equity or achieve a sustained reduction in poverty. This line of thinking clearly accorded preference to policies that would help attain both objectives. Hence the crucial importance of education as the foundation for this attempt to bring about structural change and productivity growth while achieving greater social equity.

Throughout the 1990s and the early years of the following decade, ECLAC continued to develop various aspects of this integrated approach to structural change, at times focusing more on economic issues, at times highlighting social considerations, but at all times setting its proposals within the institutional context of the region. At no time did these shifts in emphasis detract from its integrated conceptualization of the development process. In fact, ECLAC has always approached economic, social and institutional issues as an integral set of interacting, mutually conditioning factors.

How the relevant measures are organized and how much time is devoted to each dimension are also important factors, however. In recent works, we have stressed the social dimension, which, all the same, has invariably entailed economic and institutional considerations. This has certainly been the case in the documents issued most recently by ECLAC, such as *Shaping the Future of Social Protection* and *Social Cohesion: inclusion and a sense of belonging*. In the analysis presented in this volume, we will focus on economic and institutional issues: on the "what" and the "how" of our proposal for bringing about structural change and productivity growth in ways that are in keeping with the times, while remaining mindful of their social dimensions.

The pace of the global changes that were discussed in our 1990 proposal has accelerated, and new actors have emerged which have significantly altered pre-existing balances in the world economy in terms of both supply and demand. These events have triggered major structural changes. The time has therefore come to re-examine our views on structural change and productivity growth in the light of new circumstances in order to determine if new opportunities can help to overcome old problems.

The countries of Latin America and the Caribbean find themselves in varying positions in terms of competitiveness and learning, and it is on the basis of these positions, in conjunction with their stock of resources and capacities, that they take part in the global economy. Diversifying and developing these positions is the crux of any strategy for structural change and productivity growth. Although such strategies must clearly have national characteristics, closer coordination and greater economic integration among the countries of the region would be of enormous help in achieving greater economies of scale, complementarities and lessons learned.

Moving forward with this task within the framework of each national reality will entail mobilizing a broad range of diffuse social energies, and public policy plays a key role in this respect. It is important, first of all, to organize each country's search for a medium- and long-term vision within the global context and catalyse efforts to detect present and future opportunities. Second, it is also crucial to build lasting alliances with the private sector based on reciprocal benefits and commitments that will make it possible to formulate and implement strategies for gradually making that vision a reality and taking advantage of the opportunities that present themselves.

All of this requires the formation of a wide-ranging consensus capable of underpinning agreements in various spheres of national affairs. Viewed from this vantage point, the integrated approach to development that is so much a part of the Commission's thinking takes on renewed significance. Although proposals in given areas may be analytically separable, the type of broad national consensus that can make such proposals viable is necessarily multidimensional. In other words, in the fullest sense of the proposal for bringing about structural change and productivity growth with greater equity, social consensus-building must encompass an inseparable whole involving a unified array of agreements concerning growth, social equity and institutional development.

Chapter I examines the region's performance in the world economy, along with the opportunities that are opening up for Latin America and the Caribbean in the new global economic environment. An analysis of long-term trends relating to convergence and disparities in per capita GDP is followed by an exploration of economic growth processes and structural changes in the production sector. The discussion then turns to the main changes that have occurred in the world economy from the standpoint of both the organization of production and business models and the appearance of a simultaneous shift towards the massification and stratification of demand at the international level. The final part of this chapter looks at the strengths of the region's economic performance in recent years and at basic lines of action for bringing about structural changes and productivity growth that will enable the countries to deepen and diversify the ways in which they position themselves within the international economy.

Chapter II reviews the region's economic and export performance in the past quarter century. It begins by examining macroeconomic trends in the region, with emphasis on the internal and external elements that played a role in the slow, volatile economic growth that characterized the region from 1980 until its performance began to improve in 2003. It then goes on to analyse productivity gains as a growth factor and their close relationship to the dynamics of the production structure. Emphasis is placed on a number of productivity determinants, such as the application of knowledge to economic activities, the diversification of the production structure and the efficiency of service delivery with respect to physical infrastructure. The chapter concludes with a consideration of the way in which exports have helped to promote structural change and drive growth since 1980 through their aggregate contribution, product and market diversification, incorporation of knowledge and the technological externalities generated by trade and foreign direct investment.

Technological dynamics in the region and opportunities for improving the performance of companies and the products they export are the main focus of chapter III. A comparison of national R&D efforts and their relative effectiveness is followed by an examination of corporate innovation in various countries of the region and an analysis of its impact on productivity, wages and exports. Obstacles to the further development of process and product innovations are also identified. The unit prices of exports are then used to assess the region's capacity for positioning itself in the international economy more successfully by adding quality to its exports. To this end, the quality of its current exports is evaluated by comparing the prices of goods exported by the region with those of similar goods from developed and developing regions. The region's share of world trade over the last decade, disaggregated by level of quality, is also analysed. Finally, in view of the importance of agricultural goods for Latin America and the Caribbean, a more extensive discussion is offered of the region's position in world (and especially developed-country) markets for these products. In the light of the evidence presented in the course of this analysis, a number of ways of improving that position in terms of export quality are explored.

Chapter IV looks at the emerging opportunities for the countries of the region that are associated with multi-purpose technologies. To this end, a techno-economic paradigm is used that employs the shared evolutionary path of technological changes and economic development as a basis for understanding how the region reacts to and engages in the diffusion of these technologies in the economic and social spheres. The implications of information and communications (ICT) technologies are described, together with the elements that must be in place in order for society as a whole, the economic system, infrastructure and industry to adapt to the new processes and products that these technologies engender. The focus then turns to an analysis of the tendencies that are shaping corporate strategies and forms of industrial organization as they relate to the incipient diffusion of biotechnology. Consideration is also given to the efforts required to create a system capable of increasing and directing R&D and human resources in ways that will stimulate the adaptation and absorption of these new technologies.

Given the heterogeneity of the Latin American and Caribbean countries' production structures, any analysis of opportunities and challenges requires a sector-by-sector evaluation. This assessment is undertaken in chapter V, which describes the learning processes and technological capacities found in four different sectors which are characteristic, on differing scales of relative importance, of the production structures and international economic integration of the different countries of the region. These sectors are the agroindustrial complex, mining, manufacturing (both those industries left as a legacy by the import-substitution industrialization (ISI) model and export-oriented manufacturing industries) and services. An analysis is then undertaken of the windows of opportunity that are being opened up in each of these spheres of competitiveness and learning by new cross-cutting technological paradigms. In the final section, the opportunities for achieving upgrading in the global value chains of various products are examined.

Drawing on the foregoing analysis of opportunities and challenges for bringing about a more dynamic process of structural change and productivity growth, chapter VI explores the strategic modalities that have been adopted by a number of countries outside the region that are regarded as being "success stories". This analysis focuses on determining how these countries have organized public-sector institutional processes relating to the development and implementation of medium- and long-term national strategies within the framework of a public-private alliance. An examination of the various organizational procedures employed by the public sector and its support programmes for promoting structural change, productivity growth and international economic integration serves as the basis for the formulation of 12 "first principles" in this connection. The same parameters are then used to determine where the Latin American and Caribbean countries stand in terms of the creation of a strategic national vision, public-private alliances and consensus. This appraisal suggests that these principles are indeed relevant for a region which needs to deepen and diversify its production apparatus within the framework of today's globalization process.

Chapter VII presents a number of concluding remarks and observations dealing with some of the central points made in this document, together with a discussion of opportunities for the region to move forward with a process of structural change and productivity growth that can accelerate the rate of economic expansion and help it to achieve greater social equity.

Chapter I

Latin America and the Caribbean in the world: trends and opportunities

The current phase of globalization is yielding unprecedented opportunities but is also creating uncertainty and difficulties in the economic, social, political and cultural life of millions. Extraordinary growth in world trade and dynamic technological change have been taking place even as inequality within and between nations has been rising. In these circumstances, what were once developing economies have been undergoing remarkable transformations, moving in a few generations from poverty to prosperity and forming a new group of emerging actors in the global economy. For all their special characteristics, these cases share a common element, which is their strong productive linkage with one or other of the three hubs (United States, Europe and Asia-Pacific) that account for the bulk of manufacturing and service activities, trade and investment and, most particularly, the human and material resources that drive technological progress.

Section A examines the performance of Latin America and the Caribbean in this long-term evolution of the global economy. Since its early entry into the internationalization process, and up until the 1970s, the region's history might be summed up as a case of stabilization at an intermediate position in the global economy and of isolated and incomplete convergences, rather than as one of steady divergence from the developed countries and the new emerging actors. Only since 1980 has Latin America and the Caribbean fallen further behind these two groups, mainly because of the debt crisis in that decade and then the thwarted recovery of the 1990s. Thus, until strong growth resumed in

2003, the region's performance was characterized by poor economic growth with highly volatile annual rates.

The underlying causes of economic growth have been the subject of far-reaching theoretical study and reflection that began in the 1940s and in which ECLAC has been an important actor. The conclusions are that the development process does not take place gradually and automatically, since steady economic growth brings into play a variety of elements and mechanisms associated with the mobilization and allocation of resources and the social and institutional characteristics that provide the framework of motivations and incentives to which economic actors respond.

Much of the analytical work that has been done on economic growth has sought to rationalize the existence of pathways of sustained expansion based on technical progress and, in particular, endogenous innovation processes tending to counteract declining yields. By allowing a larger quantity of goods to be incorporated into the production process, productive investment and diversification lead to steady increases in productivity across the board. This is why section B, after briefly reviewing some development models, stresses the importance of three interconnected and mutually reinforcing factors: investment, innovation and productive diversification. On this basis, certain general features of the economic growth process and the policy criteria involved are also highlighted from a regional perspective. For a more specific understanding, it is necessary first to analyse the environment in which these processes might take place.

In a world of increasingly open and interdependent economies, a country's economic growth depends on the opportunities offered by product and factor markets and on the dynamics generated by ever-increasing international competition. On the one hand, the engine of globalization is fuelled by productivity growth resulting from the emergence of new technologies and faster change in existing ones, factors that have substantially altered the way production is organized in firms, production sectors and, ultimately, the global economy. These changes were given an enormous boost when China, India and the former Soviet Union opened up to trade and foreign direct investment. From the end of the 1970s, and particularly in the decade that followed, these economies gradually turned into leading actors in the new systems of productive organization and business models that provided the basis for the strategies of the most globalized firms.

Given that each worker is also a potential consumer, meanwhile, the corollary of today's economic expansion in recently industrializing countries is enormous demand growth. This is causing a number of consumer goods to be produced and consumed on an unprecedented scale. At the same time, high incomes in the developed world, the growing concentration of personal income in both developed and developing countries and the greater diversity of consumer interests and lifestyles are leading to diversification and stratification in the consumption structure. A twofold development is therefore expected: an explosion in demand for various high-volume but low-value goods, and the emergence of consumption niches for high-priced differentiated, unique or personalized goods and services. Section C examines these trends in global production and consumption, an understanding of which is essential if new opportunities for participating in the global economy are to be explored.

These developments paved the way for a boom period in the global economy, whose growth has been accompanied by deep structural changes. The countries of Latin America and the Caribbean have succeeded, each through different mechanisms, in capitalizing on the new conditions characterizing this phase of the global development cycle. Although the region has grown less than other emerging economies, by late 2008 it will have completed an expansionary cycle lasting six years, the longest and most vigorous period of growth since 1980 and the second since 1950 to have seen rates at these levels. Despite the current upheavals in the international situation, the structural changes which have accompanied this global development cycle are expected to carry on intensifying over the coming years.

Accordingly, section D considers how this global expansion might be taken advantage of to enable the region's countries to commit themselves to productive transformation processes that add greater value and knowledge, thereby expanding and modifying their traditional roles in the world economy. Each country's current position is the outcome of its particular pattern of participation in different areas of competitiveness and learning. The windows of opportunity now opening up in the new technological paradigms are having a fundamental impact everywhere, and no production sector is unaffected. If full advantage is to be taken of them, however, there will need to be a considerable internal technological effort to move the production structure progressively towards activities that hold out better prospects of generating and spreading innovations. Thus, technical progress and structural change, as ECLAC pointed out early on, have synergistic effects (ECLAC, 1990).

Whatever the specific form that development strategies may take, innovation and productive diversification do not happen spontaneously and solely in response to market signals. The externalities associated with the innovation process and coordination and information failures have to be considered so that appropriate interaction procedures and incentive systems can be designed. In one way or another, this point has been highlighted in the classical texts on development economics and is plainly illustrated by the historical experience of what are now developed economies, as well as by cases of rapid convergence like those of the different Asian countries in the last half-century.

The transformation of activities and behaviour, which is the outcome of a huge array of mutually complementary actions, is a collective process by its very nature and thus demands public policies that are designed to mobilize a wide variety of dispersed social energies.

A. A long-term view

Globalization is generally acknowledged to have generated historically unprecedented opportunities for progress in developing countries, but also to have created wholly new issues, problems and negative consequences for the social, political and cultural life of millions of people. Globalization is generating interdependence and imbalances and intensifying competition and inequality between nations. Indeed, widening disparities between regions and countries have been a characteristic of the global economy for the last two centuries (Pritchett, 1997).[1] The ratio between the per capita output levels of the world's most and least developed regions leapt from about 3 in the early nineteenth century to almost 20 in the early twenty-first century (see table I.1).[2] Thus, the world economy has acquired the configuration of an essentially unlevel playing field (Ocampo and Martin, 2003a; ECLAC, 2002).[3]

This trend has some distinctive features (see table I.2). First, there was a period when per capita output was clearly converging, but only between the developed countries. This convergence took place between 1950 and 1973 among the industrialized countries that now form the Organisation for Economic Co-operation and Development (OECD), a period that has been called capitalism's golden age (Marglin and Schor, 1990), and the tendency has continued to this day. In one subgroup of the OECD, convergence was hastened by the creation of the European Economic Community, the predecessor of today's European Union, under the 1957 Treaty of Rome.[4] Successive increases in the number of member States brought more and more countries into the convergence process, including the Nordic countries and Ireland and the countries of the Iberian peninsula. Enlargement of the

1 There has been a simultaneous tendency for internal income distribution to worsen in developed and developing countries alike. See Ocampo and Martin (2003a).

2 This is the ratio between the most developed group of countries (except in 1820, this group is formed by Australia, Canada, New Zealand and the United States) and the least developed region (Africa or Asia, depending on the year) (see table I.1).

3 As opposed to the concept of a level playing field that has been widely aired in recent international debates.

4 The process can be traced back as far as 1951, when the European Coal and Steel Community was founded in Paris. Six countries were members: Belgium, France, the Federal Republic of Germany, Italy, Luxembourg and the Netherlands.

European Union to take in the Baltic countries and those of central and eastern Europe has prepared the way for new accessions to this process. In each case, convergence was not spontaneous but the result of active policies. The explicit policies successively adopted for this purpose by the European Union are well known, of course, as is the volume of financing mobilized through structural and cohesion funds to make them viable. Equally well known is the extraordinarily important role of development planning and the enormous volume of financing made available for the reconstruction of Europe and Japan after the ravages of the Second World War.

Table I.1

DISPARITIES BETWEEN THE WORLD'S REGIONS, 1820-2006

	1820	1870	1913	1950	1973	1980	1990	2006
A. Per capita output, by region [a]								
Western Europe	1 204	1 960	3 457	4 578	11 417	13 197	15 965	21 098
Australia, Canada, New Zealand and United States	1 202	2 419	5 233	9 268	16 179	17 935	22 345	30 143
Japan	669	737	1 387	1 921	11 434	13 428	18 789	22 853
Asia (except Japan)	577	548	658	635	1 225	1 511	2 109	4 606
Latin America	692	676	1 494	2 503	4 513	5 183	5 072	6 495
Eastern Europe and former Soviet Union	686	941	1 558	2 602	5 731	6 231	6 460	7 000
Africa	420	500	637	890	1 410	1 538	1 449	1 697
World	667	873	1 526	2 111	4 091	4 521	5 155	7 282
B. Inter-regional disparities (percentages)								
Least developed region/most developed region	34.9	20.7	12.2	6.9	7.6	8.4	6.5	5.6
Latin America/most developed region	57.5	27.9	28.6	27.0	27.9	28.9	22.7	21.5
Latin America/world	103.8	77.4	97.9	118.6	110.3	114.6	98.4	89.2
Latin America/least developed region	164.9	135.2	234.4	394.0	368.5	343.0	350.0	382.7
C. Share of global output (percentages)								
Western Europe	23.0	33.1	33.0	26.2	25.6	24.2	22.3	17.7
Australia, Canada, New Zealand and United States	1.9	10.0	21.3	30.7	25.3	24.3	24.6	22.7
Japan	3.0	2.3	2.6	3.0	7.8	7.8	8.6	6.2
Asia (except Japan)	56.4	36.0	22.3	15.5	16.4	18.3	23.2	36.4
Latin America	2.2	2.5	4.4	7.8	8.7	9.8	8.3	7.7
Eastern Europe and former Soviet Union	9.0	12.0	13.4	13.0	12.9	11.9	9.8	6.0
Africa	4.5	4.1	2.9	3.8	3.4	3.6	3.3	3.3
World	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of J.A. Ocampo and J. Martin, *Globalization and development: A Latin American and Caribbean Perspective*, Palo Alto, Stanford University Press, 2003; and A. Maddison, *Contours of the World Economy 1-2030 AD: Essays in Macro-Economic History*, Oxford, Oxford University Press, 2007.

[a] In 1990 PPP (purchasing power parity) dollars.

Table I.2
CONVERGENCE AND DIVERGENCE IN PER CAPITA OUTPUT, BY REGION, 1870-2006 [a]

	1870	1913	1950	1973	1990	2006
OECD	0.45	0.49	0.62	0.40	0.26	0.20
European Union (15 countries)	0.37	0.40	0.45	0.26	0.21	0.18
Developing countries	0.33	0.46	0.85	0.92	0.87	1.01
Latin America and Caribbean	0.52	0.62	0.49	0.56	0.58	0.69
Transition economies	0.35	0.37	0.41	0.39	0.39	0.62
World	0.56	0.65	0.93	1.05	1.06	1.18

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of A. Maddison, *Contours of the World Economy 1-2030 AD: Essays in Macro-Economic History*, Oxford, Oxford University Press, 2007.

[a] Standard deviation of the logarithm of per capita output.

Secondly, attention should be drawn to the marked differentiation produced in the developing world by the emergence of Asia, which has been playing a greater and greater role in the world economy. Per capita output growth in Japan since the 1950s, in the so-called Asian tigers since the 1970s and in other countries of the region in recent years, most especially China since the 1980s and India since 1990, has made a decisive contribution to this. Since 1980, therefore, there has been divergence between a growing group of Asian countries and all other developing countries.

Combined with the differences in population size and dynamics between the different regions of the world, these variations in per capita output growth have substantially altered the distribution of world output (see table I.1, section C). In the nineteenth century, the most salient feature was the preponderance of western Europe and the "western offspring" (Australia, Canada, New Zealand and the United States) at the expense of Asia.[5] More recent times have seen the consolidation of a third hub in Asia whose share of world output, if Japan is included, has overtaken that of Western Europe and the "western offspring" combined thanks to its concentration of manufacturing activity, thereby creating a third dynamic axis of contemporary capitalism.

A decisive element in the emergence of this third hub in Asia is the nature of technological change, which has led to the fragmentation of production and its reorganization into global value chains (see section C) and a large increase in the integration of production and thus trade in Asia. In relative terms, indeed, the intraregional portion of Asia's trade exceeds that of the North American Free Trade Agreement (NAFTA) countries and is approaching the European Union level (see table I.3). Furthermore, the intraregional trade intensity index, which takes the size of each region's markets into account, reveals that in 2006 intensity was higher in Asia (2.3) than in Europe (1.7), and was very close to the NAFTA level.[6]

Thus, not only do these three hubs between them account for an extremely large percentage of world output and technological change, but each of them has a high degree of internal production complementarity. At the same time, there is a large amount of trade and investment between them. The rest of the world has to contend with solid barriers to entry, owing to two main factors. First, there are economies of agglomeration which accentuate the tendency for innovation and technological learning to become concentrated in a limited number of places where a range of technology-related capabilities are to be found together (Lall, 2003). Second, technological innovations are path-dependent, i.e., innovations tend to spring from the capabilities that already exist in particular locations (Farfán, 2005). The concentration of research and development

[5] The term "western offspring" was coined by Maddison (2001) to denote the group of countries comprising Australia, Canada, New Zealand and the United States of America.

[6] This index is the ratio between the respective shares of intraregional trade and world trade in the region concerned, based on export figures. A higher ratio indicates a greater dependency on intraregional trade (ECLAC, 2007a).

spending in the three hubs is very high, exceeding 90% of the world total, as figure I.1 shows. Between 1990-1995 and 2000-2003, Asia and the Pacific increased their share at the expense of the European Union, most particularly owing to higher spending in China, whose share rose by almost 5% between the two periods.

Table I.3
INTRAREGIONAL TRADE, BY GEOGRAPHICAL GROUPING [a]
(Percentage of the region's total trade)

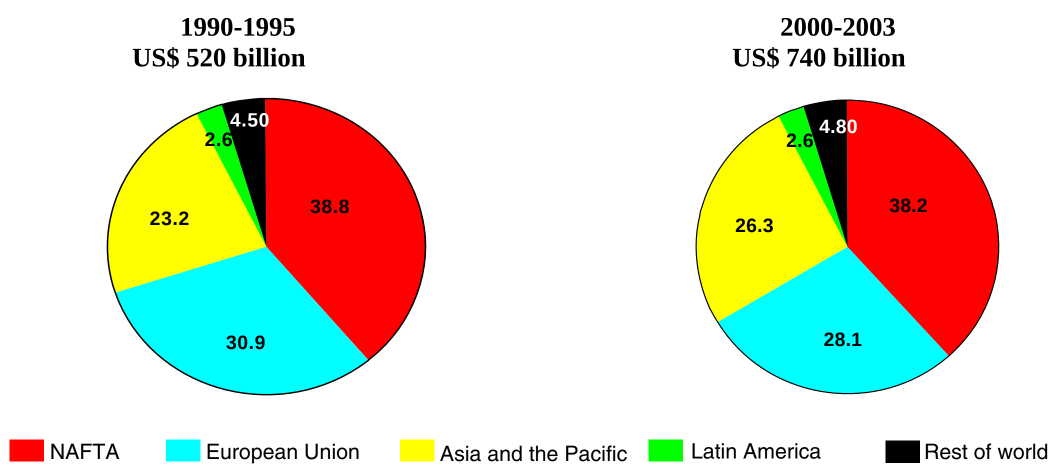
Region	1980	1985	1990	1995	2000	2006
Asean+3+2 (15) [b]	34.1	37.1	43.1	51.9	52.1	54.5
European Union (27)	61.3	59.8	67.0	67.4	66.8	65.8
NAFTA (3)	33.8	38.7	37.9	43.1	48.8	44.3

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of information from the United Nations Commodity Trade Statistics Database (COMTRADE).

[a] The intraregional trade share is the percentage of the region's total trade represented by intraregional trade, measured using export data. It is calculated as follows: Xii/[(Xiw+Xwi)/2], where Xii are the exports of region i to that same region, Xiw are the exports of region i to the world and Xwi are the exports of the world to region i.

[b] ASEAN+3+2 includes the 10 countries of ASEAN plus China, Japan and the Republic of Korea, plus Hong Kong (SAR of China) and Taiwan Province of China.

Figure I.1
DISTRIBUTION OF RESEARCH AND DEVELOPMENT SPENDING, BY REGION
(Percentages)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of information from the United Nations Educational, Scientific and Cultural Organization (UNESCO); Ibero-American Network of Science and Technology Indicators (RICYT); and Organisation for Economic Co-operation and Development (OECD), *Main Science and Technology Indicators*, Paris, various years.

This has clear consequences for other developing countries, which tend to be left out of this system of innovation and growing productive integration. Furthermore, they are penalized by the hubs' tariff structures and other protection mechanisms as these are unfavourable to commodities, particularly more highly processed ones, which are directly affected by tariff escalation (ECLAC, 2006a). This is compounded by substantial differences in financing costs and access between the hubs and the rest of the world.

To complete this overview, two further considerations should be mentioned. First, economic growth successes and collapses in developing countries tend to group into specific periods. This means that the global development cycle affects the medium-term performance of developing countries. To this might be added the so-called “neighbourhood effects” which may benefit or penalize a particular country simply because of its location in a region that is experiencing successes or collapses, irrespective of the merits of its own performance (Ocampo and Parra, 2007).

Second, a growing distinction became apparent after the 1970s between gainers and losers in the developing world. That is, the dispersion of per capita output growth rates in the developing world increased significantly (see box I.1).

These two factors would suggest that, while the global development cycle and neighbourhood effects do affect the growth of developing countries (and the last five years have illustrated this), national policies also matter. Without them it would be impossible to account for the different dynamics of gainer and loser countries. Indeed, domestic policies oriented towards short-term performance have a decisive impact on the mechanisms whereby global development cycles are transmitted to each economy. Again, national policies that set out to influence long-term growth determinants also help to explain why some economies have proved able to extract greater benefits in expansionary phases and mitigate or even avoid growth collapses in the recessionary phases of the global development cycle. While international and regional factors, like national policies, are contingent on the circumstances characterizing a particular period, their combined effects have consequences for long-term development. Similarly, it is important to remember the point which ECLAC and the Latin American structuralist school were among the first to make, that both the dynamic of the production structure and patterns of participation in the international economy matter for long-term performance, an issue that will be addressed in more detail later (section B).

Within this long-term evolution, Latin America and the Caribbean display some particular characteristics. First, the region was an early participant in the internationalization of the world economy, particularly following the transport revolution of the second half of the nineteenth century, which facilitated the globalization of natural resources (Gerchunoff and Llach, 1998). Right from the earliest stages of this process, therefore, Latin America and the Caribbean, along with the countries of central and eastern Europe, comprised the group of middle-income countries, later to be joined by some Asian countries.

Second, while the per capita output gap relative to the world’s most developed region widened between 1820 and 1870, it then stabilized for a long period. Indeed, it remained stable for somewhat over a century at between 27% and 29% (see table I.1, section B). Only after 1980 did Latin America and the Caribbean fall further behind the developed world, mainly because of the debt crisis. Furthermore, the recovery which followed the lost decade of the 1980s was unsatisfactory. As ECLAC has pointed out in a number of studies, including ECLAC (2002 and 2004) and Ocampo and Martin (2003b), this was reflected in relatively low, volatile growth in the 1990s, after the economic reform programme initiated in some countries in the mid-1970s had spread throughout virtually the whole region.

Third, the region’s overall long-term performance encompasses very large variations by country and period. Among the most important are the periods of rapid growth in the three Southern Cone countries (Argentina, Chile and Uruguay) in the late nineteenth and early twentieth centuries, in Cuba during the first quarter of the twentieth century and in Brazil, Colombia and Mexico over several decades in the second half of the twentieth century. Until the 1970s, the region’s history might be summed up as one of stabilization at an intermediate position in the global economy and of individual cases of “incomplete convergence” rather than as one of sustained divergence from the developed countries and other developing ones. However, some of the poorest countries did indeed experience an earlier and more sustained situation of decline. In the region as a whole, though, the greatest trend shift was the one that took place in the early 1980s, and this consequently merits particular attention. There are a few exceptions to this general characteristic of recent decades.

Whereas just three countries in the region converged between 1980 and 2006 (Chile, Dominican Republic and Trinidad and Tobago), seven did so between 1990 and 2006.[7]

Box I.1

THE DISPERSION OF PER CAPITA OUTPUT GROWTH RATES IN THE DEVELOPING WORLD

The standard deviation of per capita output in the developing world in the 1990-2006 period was practically double that of the 1950-1973 period (see table). This development was particularly marked in the Middle East, Africa, Asia and the Pacific and East Asia, less so in Latin America and the Caribbean and South Asia.

ECONOMIC GROWTH: PERFORMANCE VARIATIONS WITHIN REGIONS [a]

	1950-1973	**1973-1990**	**1990-1998**	**1998-2006**
OECD	1.5	1.2	1.2	1.1
141 countries	1.8	2.6	3.4	3.2
Developing countries [b]	1.7	2.6	3.4	3.2
Latin America	1.4	1.5	2.2	2.0
Asia-Pacific and East Asia	1.6	2.1	4.2	2.9
South Asia	0.8	1.4	1.9	1.4
Africa	1.6	2.1	3.4	3.2
Middle East	2.2	4.3	4.0	4.8

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of A. Maddison, *Contours of the World Economy 1-2030 AD: Essays in Macro-Economic History*, Oxford, Oxford University Press, 2007.

[a] Standard deviation of per capita GDP growth in each region, in 1990 PPP (purchasing power parity) dollars.

[b] The 141 countries minus Japan and the Republic of Korea.

The cumulative effect of performance differences between gainer and loser countries is made apparent by the growing disparities in per capita output between different countries and regions of the developing world. Indeed, the total disparity for all developing countries, as measured by the Theil index, rose progressively from 0.24 in 1960 to 0.27 in 1980 and 0.31 in 2000 (United Nations, 2006).[a]

However, a far more significant finding arises when the total disparity shown by this index is broken down into two effects: the disparity between regions in the developing world, and the disparity between countries in each region. Thus, the percentage of the total disparity attributable to differences between countries in each region increased systematically, from 30% in 1960 to 36% in 1980 and 62% in 2000.[b] In particular, the index rose very strongly between 1980 and 2000, when the percentage almost doubled in a context of rising disparities overall (United Nations, 2006).[c] This distinction alerts us, as analysed below, to the importance of scrutinizing the large differences between developing countries, as similar extraregional external conditions have produced very varied effects at the national level.

It is also necessary to bear in mind the point made by Palma (2006) that the ranking of developing countries by per capita growth rates varies greatly from one period to another. Although growth rates are highly dispersed, in other words, the low inter-period values of the rank correlation index suggest that the leaders are not always the same countries.[d]

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

[a] The Theil index is used to compare each country's share of world output with its share of total population, weighted by the number of people. The index value can range from zero (no disparity) to log N (maximum disparity), where N is the number of countries. Maddison (2001) is the original source for the data and the regions are those indicated in that study.

[b] If China is included, these percentages change to 19% in 1960, 26% in 1980 and 65% in 2000. In other words, China's large population makes its effect on the regional differentiation process very considerable.

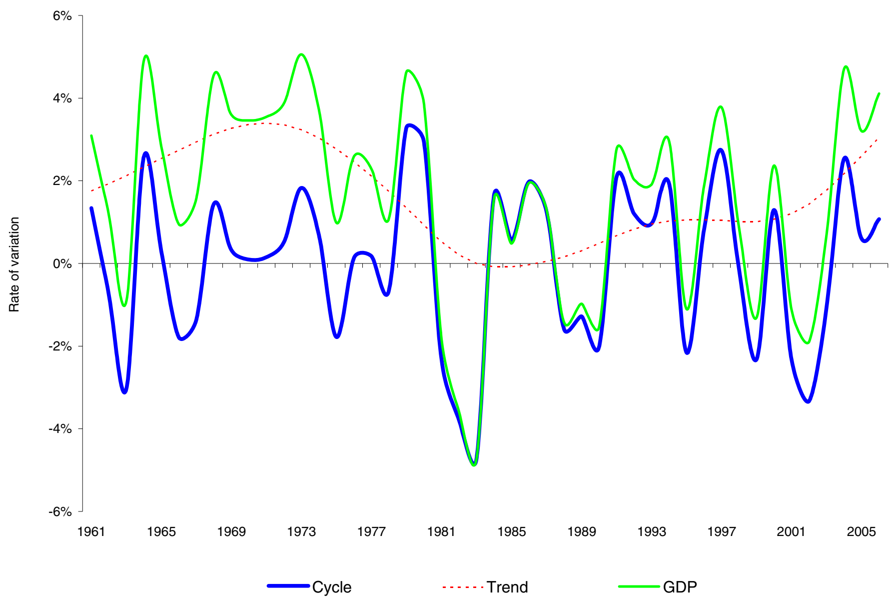
[c] In each year, the complement of the figure concerned represents the percentage attributable to the disparity between the regions of the developing world: 70% in 1960, 64% in 1980 and 38% in 2000.

[d] Calculating Spearman's rank correlation index for 110 developing countries yields the following values for average growth rates across pairs of periods: 0.11 for 1950-1973 versus 1973-1990; 0.39 for 1973-1990 versus 1990-1998; and 0.27 for 1990-1998 versus 1998-2006.

[7] The three mentioned plus Argentina, Costa Rica, Panama and Peru.

Latin America and the Caribbean are characterized not only by low growth throughout the quarter century preceding the upturn which began in 2004, but by a high level of real volatility as well. Indeed, per capita output growth there has been the most volatile of any developing region other than sub-Saharan Africa. Another way of looking at the same phenomenon is that from 1980 to 2006, by contrast with the two previous decades, there was almost no correlation between per capita output growth rates and the trend component. In other words, the Latin America and Caribbean region is the only one where output variations are due almost exclusively to the cyclical component (Titelman, Pérez-Caldentey and Minzer, 2008). The evolution of GDP there can be seen in figure I.2, where it is broken down into its trend and cyclical components.

Figure I.2
LATIN AMERICA AND THE CARIBBEAN: TREND AND CYCLICAL GDP, 1960-2006



Source: D. Titelman, E. Pérez-Caldentey and R. Minzer, "Una comparación de la dinámica e impactos de los choques de términos de intercambio y financieros en América Latina 1980-2006", Santiago, Chile, Economic Commission for Latin America and the Caribbean (ECLAC), 2008, unpublished.

The almost negligible contribution of the trend component in explaining the actual evolution of output between 1980 and 2006 in Latin America and the Caribbean can be put down to two causes: the weakness of the structural factors determining trend output growth and the sheer size of the external shocks received by the region in the period relative to its ability to absorb them.

A number of studies have pointed to the determining influence of external shocks on growth volatility in Latin America and the Caribbean.[8] In turn, this volatility has had a large negative impact on growth through different channels, not least investment (Fanelli, 2008b).[9] Again, while the relative importance of real and financial shocks has changed over time, it is undeniable that the latter were the most influential in the 1980s and 1990s (see chapter II, section A).

Lastly, irrespective of the characteristics of the global development cycle and volatility, there are structural factors that have constrained the region's growth over recent decades. Here it is necessary to bear in mind what ECLAC pointed out early on, that the dynamic of the production

8 See Ocampo (2002 and 2003); Ffrench-Davis (2006a); Izquierdo, Romero and Talvi (2007); Osterholm and Zettelmeyer (2007).
9 Volatility can also affect other determinants of growth such as financial development, the accumulation of human capital, the quality of institutions and the distribution of income (Fanelli, 2008a).

structure and patterns of participation in the international economy matter to long-term performance. This is why it is essential to conjoin short-term performance-oriented domestic policies designed to manage the mechanisms through which global development cycles are transmitted to each economy with policies to affect long-term determinants and foment productive transformation, such as measures to promote innovation and technological change, institution-building and human capital accumulation of sufficient quality and quantity. To this should be added the need for a more active presence in global value chains, the importance of making progress with the integration of regional markets and production chains, and the need to formalize and execute strategies to reinforce institutional infrastructure and public-private cooperation. Without progress in these areas, which are discussed in the different chapters of this document, it will be difficult to achieve high and stable growth rates and reconcile growth with greater equity and social cohesion.

B. Economic growth and productive transformation

The foregoing analysis highlighted a number of the most salient features of Latin America and the Caribbean's growth experiences in a long-term perspective. One of the leading characteristics is the influence of the global development cycle as it affects the regions of the developing world. In this context, there have been numerous instances in the economies of Latin America and the Caribbean where spells of strong expansion have alternated with periods of slow growth, the transitions being associated either with external events or local factors. At the same time, and despite shared economic trajectories spurred by international developments, there is a striking degree of diversity in behaviour between different countries and periods, implying that, the influence of the external context notwithstanding, national development conditions and strategies are important to growth.

Again, the world has seen remarkable transformations in economies that have moved in a few generations from poverty to prosperity, alongside instances of countries that have not achieved sustained economic dynamism or have simply stagnated. The observations are born out by econometric studies which, notwithstanding the difficulty of obtaining accurate results given the complexity of the phenomena being observed (Levine and Renelt, 1992; Pack, 1994; Brock and Durlauf, 2001), all tend to show that there is no sign of absolute convergence between different countries' income levels or of any significant diminution in the international dispersion of per capita output (see, for example, Sala-i-Martin, 2002).[10]

On the whole, as can be seen, economic growth does not happen gradually and automatically, but brings into play a variety of elements and mechanisms associated with the mobilization of resources for accumulation, the principles and processes governing their allocation and the social and institutional characteristics that provide the framework of motivations and incentives to which economic actors respond.

1. The diversification of the production structure and technical change

The evolution in thinking about structural change and growth can be traced back to the period which Krugman (1992) terms the years of high development theory. It includes authors such as Prebisch (1950), Hirschman (1958), Myrdal (1956), Nurkse (1953) and Lewis (1953). Although these authors differed from one another in some ways, they shared a perception that developing economies differed substantially from developed ones in their production structure and that this affected growth prospects. Examples of this included the characteristics of their external sectors

[10] There do tend to be processes of conditional convergence, however, between countries that share certain vital characteristics; the OECD economies are one example (see section A). If per capita income disparities are weighted by each country's population, however, the extraordinary growth of the Chinese and Indian economies over recent decades has helped to reduce the level of global inequality (see Sala-i-Martin, 2002; Bourguignon and Morrison, 2002).

(heavily dependent on a few commodities), their relative technological backwardness and the presence of a vast subsistence sector which pushed down wages and the prices of the products exported. Thus, economic development was seen as a process in which the economy attained a growing degree of diversification and in which labour was employed in increasing proportions in industrial activities, where productivity was highest. Development resulted from the creation of forward and backward sectoral linkages based on accumulation processes and stimuli generated by recurrent intersectoral disequilibria (Hirschman, 1958).

In the same years, the literature on growth and development emphasized the importance of increasing returns to scale and of externalities in boosting economic growth and industrialization (Furtado, 1956; Rosenstein-Rodan, 1961). Whether because of income distribution factors or technological externalities, a fundamental role is assigned to the characteristics of the production structure in the economic development and learning process. It might be said that increasing returns were one of the main concerns of the development pioneers, such as Prebisch, Rosenstein-Rodan and Hirschman (Ray, 2004; Arthur, 1994). There are technological and productive complementarities that require a degree of structural diversification, without which development is not possible.

The literature on the role of productive transformation in the development process attaches particular importance to productive diversification as a driver of innovation. In constructing growth models, the main effort went into identifying endogenous processes capable of counteracting the problem of diminishing returns that would tend to make the system converge on a stationary state in which per capita output would ultimately stagnate, unless there were continuous, exogenously generated technological progress (Solow, 1956; Swan, 1956; see also Mankiw, Romer and Weil, 1992).[11] The mechanisms considered in the plentiful literature on endogenous factors have been of different types, with an emphasis on the accumulation of physical resources, human capital formation, or diversification or quality upgrading of all the inputs employed in production and of final goods (Acemoglu, 2007; Barro and Sala-i-Martin, 1999).

It is worth highlighting a line of argument in these different endogenous growth model variants that emphasizes innovations capable of generating across-the-board increases in productivity by bringing a growing variety of inputs and machinery to the market and thereby expanding production opportunities. This variety is generated in turn, it is argued, by the activity of business agents motivated by the rents that can be obtained from the introduction of a new good. As a basic hypothesis, innovation is manifested in a good for which the inventor or discoverer has market power, but as a by-product (incidental to the business agent) of the innovation activity a contribution is made to the general stock of knowledge available for other agents to use (Romer, 1990). Emphasis is placed on process innovations in the production of final goods, and other formulations concentrate on the appearance of new products, again as the result of the efforts of business actors operating under conditions of imperfect competition (Grossman and Helpman, 1991a and 1991b).[12]

A different analytical approach has also been used to argue that incorporating additional goods into production can serve to compensate for the diminishing yields of “learning by doing” in respect of existing goods (Stokey, 1988; Young, 1991; Ventura, 1997). Analysis of the role of innovation has found an application in recent theories about extensive and intensive export expansion processes (Hummels and Klenow, 2005).

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11 The exogenous character of technological progress (a kind of “black box” effect) is obviously an undesirable element in these methods of analysis. As Kenneth Arrow pointed out, “a view of economic growth that depends so heavily on an exogenous variable, let alone one so difficult to measure as the quantity of knowledge, is hardly intellectually satisfactory. From a quantitative, empirical point of view, we are left with time as an explanatory variable. Now trend projections, however necessary they may be in practice, are basically a confession of ignorance, and, what is worse from a practical view point, are not policy variables” (Arrow, 1962, p. 155).

12 Other schools of thought also contributed during this period to the renewed emphasis on innovation as an endogenous growth factor (Nelson and Winter, 1982; Dosi, Pavitt and Soete, 1990).

While in some cases it is the diversification of all goods (intermediate or final) as a characteristic of growth processes that has been stressed, in others diversification has been tied most particularly to technological change with movements along "quality ladders", so that new goods improve on and replace existing ones (see, for example, Aghion and Howitt, 1992 and 1998). These "competitive innovation" arguments (Acemoglu, 2007) tie in with modern industrial organization theory and evoke the idea of creative destruction proposed by Schumpeter (1934). Their formulations have different variants when it comes to the incremental or cumulative nature of innovations, market displacement or skimming mechanisms and blocking or dissuasion behaviour, which influence the resulting market structures (see Barro and Sala-i-Martin, 1999; Aghion and Howitt, 2005; Acemoglu, 2007).

The models of this group deal with the entry and exit of firms and the corresponding conflicts of interest that may accompany growth and affect the economics of these processes. A dichotomy is also recognized between innovations that move the global technology frontier and others that allow catch-up assimilation of techniques and procedures which already exist somewhere in the world but have not yet been taken advantage of locally. This distinction (see, for example, Aghion and Howitt, 2005) is particularly relevant for economies that are not among those driving productivity improvements and technological progress (see Gerschenkron, 1962).[13] Thus, too, the existence of alternative pathways towards technological innovation and the generation of improvements in the variety and quality of the goods produced in an economy raises questions about the ways in which opportunities are actually identified given different levels of resource availability and conditions in international markets. In any event, public policies and institutional requirements for inducing and sustaining innovation processes would appear to depend on how far the country is from the technology frontier.[14]

Generally speaking, the latest studies of growth models concentrate on developments entailing greater technology intensity in production processes and a larger variety of inputs and products, but in a way that is symmetrical across different categories of goods and without highlighting the specific function that certain products and activities seem to perform at different times and in different circumstances as drivers and propagators of technological progress.

As already mentioned, the idea that the process of generating and spreading technological change is closely associated with shifts in the production structure has a long tradition in the analysis of development and most particularly in the thinking of ECLAC (see Bielschowsky, 2007 for a recent review). From this perspective, however, the configuration of products and factors embodies the process whereby objects, knowledge and capabilities are accumulated, and at the same time creates or shapes opportunities going forward, i.e., the sectors or activities into which the production structure diversifies are important for future growth (see Prebisch, 1950 and 1964; Kaldor, 1967; Furtado, 1979; Pinto, 1979a and b).[15]

Arguments along these lines have been returned to of late, owing particularly to empirical observations of the different compositions of the baskets of goods exported by countries with different income levels and of changes in export structures as they progress along growth paths (Hausmann and Klinger, 2006; Hausmann, 2007; Hwang, 2007).

[13] The development of frontier innovations appears to be subject to threshold effects (an instance of the non-linearities referred to later). Empirically speaking, it has been found (Klinger and Lederman, 2006) that inventions (as indicated by patents) are generated in countries with per capita output in excess of a certain minimum level (some US$ 7,000 at purchasing power parity in 1995 prices), and that what predominates below this level is the adoption of innovations incorporated into capital goods or obtained through licensing or imitation. Latin America generates fewer discoveries than would be expected from its income level (CAF, 2006).

[14] This seems to be the case for comparatively advanced economies as well. For example, the analysis of innovation policies in the European Union conducted by Aghion and Howitt (2005) concluded that there needed to be reforms to incentive systems and institutional frameworks to drive advances in the global technology frontier.

[15] See ECLAC (1990 and 2004a), Fajnzylber (1983 and 1990) and Ocampo (2005a) for further reflections on the subject.

According to these analyses, increases in aggregate income closely track diversification and improvements in the quality and sophistication of the products exported, and thus of goods in whose international markets firms operating in the country prove able to compete. Something else that reappears here is the emphasis on the sectoral specificities of technological progress and on the differential dynamism of certain activities when it comes to generating innovation.

This document takes the approach that the production structure is vital to the innovation and growth process, and it sets out principally to analyse the extent to which the characteristics of the production structure, the different categories of goods and firms and the organization of production generate heterogeneities in technological learning processes (see chapter V).

2. Economic growth policies: alternatives and some general criteria

As noted earlier, it is possible to observe a variety of effects that help us understand economic growth processes and act accordingly. At the same time, as the logic of research requires, each analytical approach concentrates on a subset of mechanisms whose repercussions are explored after stripping out interactions with other equally plausible ones and conditions that might modulate the strength of their effects on behaviour and institutional environment characteristics, for example. Generally speaking, economic growth models set out to rationalize processes of gradual, continuous expansion in which a given mechanism accounts for the whole of the dynamic from beginning to end. While these simplifications are useful and necessary in analysis, they must not make us forget that it is actually non-linear developments that tend to prevail, so that forms of economic growth are determined by parameters of only local validity. Consequently, while there are doubtless basic principles and propositions that apply to all economic growth processes, there is no "general model" (or econometric representation) that can supply accurate, reliable coefficients for the whole range of possible situations. At the same time, if the whole set of potentially operative mechanisms is considered, the economic policy implications differ depending on which of them is emphasized. Of particular interest, accordingly, is the search for opportunities and constraints that apply in concrete cases.

The existence of a resource endowment of a given size and composition as an ineluctable starting point means that the characteristics of the growth that can be attained are necessarily part of a historical process, i.e., are path-dependent. Again, the allocation of today's goods and labour to generate future production is manifested practically in tangible objects of different kinds and in specific personal skills and knowledge. In one way or another, increases in production capacity entail the accumulation of resources with differentiated characteristics and functions. The opportunity costs that arise in each instance define choices between alternative applications. This being so, the decisions that lead to growth entail choices between options and priorities in each particular economy, as determined by the constraints and preferences of that particular case (see Hausmann, Rodrik and Velasco, 2005). Choices also have to be made in the general stance of economic growth strategies (for example, between specialization or diversification, flexibility or the maintenance of a given production path, exploration of new opportunities or exploitation of those already being pursued) and between economic policy methods and instruments.

While recognizing this complexity, it does seem possible to focus on certain features of the economic growth process and the policy criteria involved, from a regional perspective. In all the issues raised, three interconnected aspects emerge as particularly important: the intensity of capital accumulation, which depends on how high the investment rate is; the amount and effectiveness of the resources used to generate and apply productive innovations; and the alterations in the production structure that accompany and foster growth in human, physical and technological capacity.

(a) Sustained investment and saving

Both economic analysis and the empirical evidence show that accumulating physical capital is not enough in itself to set a country on a path of economic growth. The relative importance of the technological effects "incorporated" into machines can be presumed to vary over the course of the growth process, with a tendency to decline as the economy evolves in its capacity to generate new productive knowledge. Meanwhile, high levels of physical investment may well imply diminishing returns or simply an inappropriate use of resources.[16] Whatever their direct contribution to production capacity, however, investments act as vehicles of technological progress and enhance the returns on education and innovation. It seems unlikely that a process of economic growth and transformation can be consolidated unless it includes a substantial flow of productive plant and equipment (see chapter II).

One of the basic prerequisites for high investment rates is a willingness on the part of agents to plan and allocate resources over reasonably long time horizons. This also holds for decisions about human capital formation and innovation, whose effects often stretch over several decades. As a general proposition, in other words, the "future vision" of productive agents, particularly groups that own and control large quantities of resources, appears to be a basic condition for generating the factors that induce economic growth. Much the same is true of the supply of savings: societies where segments with the ability to save (public sectors and high-income groups) are "impatient" (either because of behavioural characteristics or because uncertainty creates biases towards the present) are constrained to limit their accumulation or depend on borrowing, with all the associated problems and risks that the region knows so well.[17]

When it comes to promoting growth-oriented behaviour, the main concern is to ensure that macroeconomic developments keep capacity utilization high. On the whole, even for activities that participate strongly in external trade, the situation and prospects of the domestic market play a significant part in decision-making, especially in larger economies.[18] There can be no doubt that expectations of increasing demand are a crucial incentive to investment, and following periods of cyclical contraction it is possible that investment plans may lag behind signs of reviving consumption. Again, there may well be a causal link in which higher incomes lead to saving (see, for example, Rodrik, 1998).

In any event, an economy's accumulation of net assets depends on the willingness of residents to divert resources from immediate consumption. External saving may make a large contribution to capital formation and prevent the build-up of excessive pressures on current spending levels. However, international lending should not be expected to provide the bulk of financing for aggregate investment, and it would be dangerous if it did: it has been shown on various occasions in the region that economies with large external funding requirements are particularly vulnerable to the vagaries of a resource flow that tends to behave in a highly procyclical way (ECLAC, 1995 and 2004a). Meanwhile, restraining public- and private-sector budgets to leave some room for manoeuvre is a way of forestalling adjustments that cause production and domestic

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16 See Easterly (2001) and Restuccia (2007) for arguments highlighting the effect of distortions in physical capital allocation. In any event, the possibility of resources being applied unproductively also exists in businesses that make intensive use of other factors. Consequently, there is a general requirement to be vigilant about the quality of investment, irrespective of the sectoral or factorial characteristics of growth.

17 Concern about levels of saving is of long standing in the region, which has a tendency to incur expenditure against future income growth that does not always materialize. See Prebisch (1944) on Argentina: "Investment (…) can be used to increase the efficiency of production and the quantity of goods and services, i.e., the quantity of the country's net returns. Without this it will not be possible to achieve a progressive rise in living standards. Far from there being any prospect of the country suffering from excess saving in the immediate future, what I see with great concern is a lack of domestic saving forcing us to import excessive amounts of foreign savings." His argument about the negative impact that consumption aspirations in high-income sectors may have on investment and growth is well-known: "Consequently, the Latin-American countries need to accumulate an enormous amount of capital. (…) Capital formation has to overcome a strong tendency towards certain types of consumption which are often incompatible with intensive capitalization. (…) Saving means refraining from consumption and is thus incompatible with certain types of consumption peculiar to relatively high income groups" (Prebisch, 1950).

18 See Ffrench-Davis (2006b) for an analysis of the importance of local demand-oriented activities to the development of the economy.

demand to contract. Nonetheless, their own proclivities and also the attitudes of international lending organizations have meant that the countries of Latin America and the Caribbean have not traditionally tended to increase their domestic saving efforts at times of relatively high external capital inflows.

Macroeconomic considerations underline the importance of large-scale exporting as a way of generating revenues to underpin domestic demand, provide funds (if appropriate channels exist) to finance investment and meet import costs out of domestic resources (see Thirlwall, 2003). At the same time, as discussed in the following chapter, participation in international markets and exports can be an important channel for learning effects and innovation due to the need for competitiveness (see ECLAC, 2004a).

(b) Innovation in accordance with local conditions

Innovation is an essential part of the effort to increase the effectiveness of existing resources and hence promote economic growth. At the same time, as with any investment project, the returns on resources used in different knowledge creation, dissemination and utilization activities will depend on the structure and conditions of the economy.

The starting position of the economy will have a particular influence on the principal mechanisms of technological progress. As we have seen, a stylized sequence (which, as such, is bound to have exceptions) could involve incorporating new goods and production procedures through investment in latest-generation plant (probably imported), inviting certain forms of foreign investment and purchasing licences or patents; then introducing adaptations and improvements via imitation or modifications at the margin of products or processes; and lastly, bringing innovations at the global technology frontier into production. A progression of this type will vary from country to country, with different operating mechanisms, leading actors and policies. As ECLAC (1990, p. 71) argues, “technological opportunities and stumbling blocks, the experience and skills acquired by individuals and organizations, and the capabilities and experience which flow from one economic activity to another tend to establish a framework which, on the one hand, is particular to each country, region or even enterprise and which, on the other, is a basic ingredient in the process of innovation”.

Creating a tendency towards sustained growth means ensuring that public- and private-sector behaviour is appropriate to an environment requiring adaptation and change. Once an initiative has been taken, events themselves may determine whether opportunities are increased and spread by following that path, or whether there are diminishing returns and obstacles to progress in the direction planned. The most important thing, then, will be a margin of flexibility to intensify efforts in a particular direction or try different approaches. This reminds us of the importance of developing general capabilities that allow possibilities and alternatives to be continuously explored. At the same time, development processes generally involve heterogeneities in the pace and methods of progress in different segments and regions. Consequently, one particularly difficult issue is the need to identify types of behaviour and decide on public policies conducive to the spread of growth and technological progress throughout the economy while maintaining incentives for dynamic areas.

In particular, while frontier innovation plays a key role in productive transformation in developing countries, it will be difficult to move from adoption to adaptation and ultimately creation unless capabilities are built up at the different stages. Consequently, the region’s countries need to encourage the creation of capabilities, in the form of human resources and institutions, for technological research and learning in and beyond firms in the different phases of each country’s development.

(c) The evolving production structure

Both casual observation and econometric evidence show that the creation and use of technological progress and the growing sophistication of the goods produced and consumed are prominent features of more developed economies. It has been observed that as per capita output rises, the production structure of countries tends to evolve so that the degree of sectoral concentration of production and employment initially declines, only to rise again once the economy attains high income levels (Imbs and Wacziarg, 2003; see also CAF, 2006).

There are undoubtedly effects that, when consumption baskets are expanded, for example, tend (as Engel's law postulates) to induce structural changes as a result of economic growth. However, there are also mechanisms producing a causality in the other direction: an evolving production structure and more thorough-going application of technology are crucial ingredients in persistent and substantial growth. The development process leads, therefore, to the diversification of activities, products and production processes in two ways: an increase in the variety of goods produced and used by the economy, complemented by a higher content of technical capabilities and know-how incorporated into them.

From the standpoint of the economy as a whole, a more varied "portfolio" of undertakings would reduce the aggregate impact of the risks of individual activities, which would weigh heavily on the overall economy if there were a high level of specialization. Again, diversification would increase the degree of flexibility in the face of contingencies by mitigating the lock-in effects of decisions that later prove inappropriate to the circumstances (Arthur, 1989). Knowledge externalities could also be enhanced by increasing the number of actors interacting in learning networks (see, for example, Stitling, 1998 and 2007; Dosi, 1992).[19] It is also true, though, that diversification could give rise to high production costs if it limits the scope for benefiting from economies of scale and increases transaction costs.[20] This tension would be eased if investment in the economy grew sufficiently for average project size to remain adequate even as the number and variety of projects increased. Notwithstanding opportunities in the external market, therefore, there might be expected to be an association between the size of economies and their degree of productive diversification (see box I.2).

Setting out from the recognition that diversification is an important element in the growth process, the question of the development path for goods and activities has to be addressed. The general proposition that economic growth requires a gradual movement towards greater technology intensity needs to be fleshed out by a concrete sequence of actions and projects. On the basis of Prebisch's pioneering contributions, ECLAC has emphasized the importance of identifying and sustaining activities that, for a given time and place, perform an essential role as drivers and propagators of technological progress. In the ECLAC tradition, industrialization has been perceived as a factor of technological progress, in addition to its role in generating employment opportunities and higher incomes. ECLAC (1990), while continuing to treat industrialization as the core of productive transformation, argues that it needs "to go beyond the narrow sectoral framework within which it has so far been approached, so as to link it with other areas of primary production and services in order to integrate the productive system and further the progressive homogenization of productivity levels".

[19] It has also been argued that diversifying production would have economic consequences by diluting the influence of particular interest groups; see Grabher and Stark (1997) for an illustration in the specific context of the Italian economy.

[20] The laws of economics also apply to diversity. One cannot have the best of all worlds, and diversity is no exception (Weitzman, 1992).

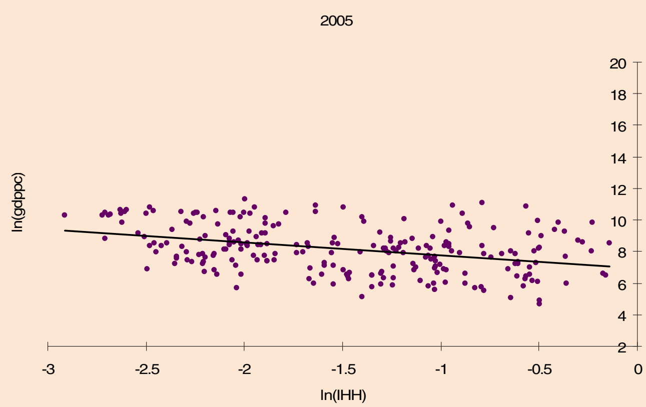
Box I.2
PRODUCTIVE DIVERSIFICATION AND ECONOMY SIZE

The size of a country's economy and the effect this has on different aspects of economic performance have been the subject of analysis and controversy. Adam Smith sensed that market size placed limits on the diversification of economies. More recently, a number of studies into endogenous growth have emphasized the benefits of greater size (scale effect) for the accumulation of human capital, the spread of knowledge and increasing returns on production. In an ever more globalized world, however, liberalizing external trade may serve to supplement a country's economic scale, since the two factors of trade and domestic market size combine to determine total market size and opportunities for acquiring knowledge.

In particular, Imbs and Wacziarg (2003) and Klinger and Lederman (2006) have explored the relationship between per capita income and the diversification of the production structure and exports, respectively, in a large number of countries that display appreciable differences in economy size and openness to external trade. [a] To examine the influence of these variables on the diversification of an economy, the following model was specified:

$$\ln IHH_t^i = \alpha_t^i + \lambda_t + \beta_1(size) + \beta_2(size * openness) + \varepsilon_t^i$$

where ln IHH is the logarithm of the Herfindahl-Hirschman index for each country's export basket to the 3-digit level in the Standard International Trade Classification (SITC, rev. 3); size is gross domestic product in current dollars, in logarithms; and openness is measured as the share of exports plus imports in current dollar gross domestic product, in logarithms.



The results (276 countries and regions, from 2002 to 2005) indicate that the larger an economy is, the greater its productive diversification (measured in terms of lower export concentration). However, the effect, which is statistically significant at 1%, is not very great: for a rise of 1% in size, specialization decreases by 0.16%. Again, this effect does not diminish as a consequence of interaction between size and openness, since the respective coefficient is not statistically significant.

The measurement of an economy's degree of diversification presumably depends to a great extent on the level of aggregation of the data used to prepare the specialization (diversification) index. To demonstrate this proposition empirically, the IHHs were calculated at the 6-digit level of the Harmonized Commodity Description and Coding Systems. As was to be expected, the ratio between size and diversification virtually doubled (0.33) when more disaggregated data were used.

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

[a] Imbs and Wacziarg (2003, p. 81 and footnote 30) analysed the possible effect of economy size on sectoral diversification and estimated this ratio by studying two subsets of countries differentiated by size: one that did not include the countries in the top quartile (largest countries), and one that did not include the countries in the bottom quartile (smallest countries). In both cases, the authors concluded that the relationship between sectoral concentration and income did not vary.

The existence of an association between the type of goods produced by an economy and its income level has been pointed to in a number of recent studies. These show a pattern where the highest per capita output values are found alongside an export basket with a large technology content (see, for example, Hausmann and Klinger, 2006; Hausmann, 2007). They also identify groups of products that tend to be correlated in countries' exports (i.e., if a country sells a product from the group abroad, it is statistically likely to sell another from the same group) and find that, as economies develop, they tend to increase the sophistication of their exports by moving up the scale with goods in the groups for which they already had a market presence. Once the economy "positions" itself in a given sector, there appear to be good prospects of generating relatively rapid technological progress within the knowledge frontier. Thus, more diversified production structures have access to more opportunities of this type, subject of course to the constraints represented by existing capabilities and by the scale effects that determine minimum sizes for efficient production. Some types of manufacturing specialization (particularly in activities with a medium and high technology content) would appear to facilitate comparatively simple and direct progress because they are based on groups in which some incremental quality improvements can be achieved using existing markets and resources. This is not believed to hold, however, for economies that export natural resources.

(d) Questions for the future

What all the above shows is that investment, innovation and productive diversification are now generic elements in growth processes. However, their pace, timing and characteristics depend on a range of factors which include not just the economy's degree of development and current capabilities but also, and very importantly, policies to promote interaction and feedback between them.

This leads us directly to major questions about the region's growth process. How can a growth path be constructed from the specificities of the Latin American and Caribbean countries? Can it even be done, given the characteristics of their current production structure and capabilities? What choices does today's international context offer? Section D provides some answers to these questions, and the rest of the document offers judgements to back them up.

In any event, whatever the specific form taken on by development strategies, it does not seem likely that a phenomenon like productive diversification will occur automatically, simply as a result of market signals. The transformation of activities and behaviour is the result of a great variety of mutually complementary actions and is a collective process by its very nature. In one way or another, this point has been emphasized in the classic contributions to development economics and has been borne out by the historical experiences of what are now the developed economies, as well as by examples of swift convergence as seen in various Asian countries over the last half-century. The presence of externalities, particularly in the generation and exploitation of technological change, means that potential problems of coordination failure and information excesses or spillovers have a prominent place (Hausmann and Rodrik, 2006), and these require attention so that appropriate interaction procedures and incentive systems can be designed.[21] At the same time, the problems of incentives and public-sector management limitations are also an important element of the data. The right way of weighting and processing market and State failures will depend on specific parameters and cannot be resolved by an abstract general proposition.

From this perspective, the choice of approach for exploiting opportunities and exploring new areas of production would seem to depend on international market prospects and, most especially, the availability of resources (including in particular the knowledge and experience built up by productive agents, and organization and management capabilities in the public sector and elsewhere). At the same time, an important issue for growth policy is to contribute to capacity-building so that a steady performance can be maintained over longer and longer periods, something that, over time, presumably implies the economic structure moving progressively further from its starting point. It would also seem to be important to try to identify the critical drivers behind

[21] There are analogies and differences between the problems of developed countries, where innovation tends to shift the global technology frontier, and those of economies where technological discoveries and improvements take place because of movements within that frontier. In the latter, it is possible, on the one hand, that the lack of formal protection (like a patent) may limit incentives to introduce technological adaptations and, on the other, that the existence of "free use" opportunities may stimulate the introduction and exploitation of potential improvements in methods and techniques.

learning effects and the spread of technology, given that, in principle, these could originate in the supply of particular factors, in the performance of certain activities or in international market participation; the sequence of effective actions could be different depending on which of these circumstances obtains.

Given that economic growth entails ever deeper trading relationships and the mobilization of growing quantities of more and more diverse resources, elaborate mechanisms are needed to coordinate and systematize the behaviour of numerous individuals. There are institutional requirements that have to be met for these mechanisms to be viable. Consequently, the development of the appropriate institutional conditions is at the root of the growth process. At the same time, forms of contract and interaction vary depending on the characteristics of economies and business sectors. The priorities applied when designing and operating the regimes that underpin and regulate economic behaviour could, then, be influenced by the situation of the economy and the path it is moving along. Again, the structural changes entailed by sustained growth processes themselves alter the matrix of interests, perceptions and relative power in different groups, while the problems of collective action that need to be the focus of attention also vary. The "demand and supply" of institutional change are thus elements in the evolution of the economic system, along with the accumulation of resources and the changes in behaviour that accompany and determine growth.

Before the opportunities and challenges associated with productive investment, innovation and diversification in the region are analysed, however, the next section will look at the characteristics of the current international context in which these opportunities will have to materialize.

C. Today's global economy

The economic recovery of Europe and Japan after the Second World War was followed in the developing world by the rise of the so-called Asian tigers. From 1970 onward these economies experienced substantial economic growth, rapid and sustained productive transformation and considerable progress with social equity.[22] Their global impact was largely confined to a handful of sectors, however, led by wearing apparel and electronic goods, and they did not seriously disrupt the global order.[23]

The great productive changes in the world economy only really took off when China, India and the former Soviet Union opened up to trade and foreign direct investment in the late 1970s and, to a far greater degree, in the 1980s. Because these are continent-sized countries with large populations, a wealth of natural resources, abundant labour and well-trained scientists and engineers, plus a growing ability to absorb and bring on new technologies, they became leading contributors to world output with the ability to disrupt the traditional balance between the transnational enterprises of Europe, Japan and the United States (Dahlman, 2007).

To begin with, transnational enterprises saw these changes as an excellent opportunity to shift some production to those regions, in some cases via the Asian tigers, thereby drawing on a huge pool of low-cost labour to produce for the developed country markets that accounted for over 80% of global consumption. Subsequently, transnational enterprises also began to deconcentrate more complex logistical and commercialization functions and research and development activities after intensive negotiations with host country governments (UNCTAD, 2005a).

However, workers will increase and diversify their consumption as their earnings rise, and the size of these countries means that the potential effects may be colossal. Firms the world over can now

[22] See Freeman (1987), Fajnzylber (1983) and Amsden (1989) for an "early" analysis of the transformation undergone by these countries and its likely impact on the world economy.

[23] The manufacturing model which did have profound consequences for the United States and western Europe was the lean manufacturing system devised in Japan and later adopted by the Republic of Korea. See Dertouzos, Leste and Solow (1989).

reach consumers in China, India and the former Soviet Union who were previously inaccessible because of political and trade barriers, and have begun to implement strategies to enter these markets.[24]

At the same time, high incomes in certain countries, the increasing concentration of personal income in both developed and developing countries and the greater diversity of interests, fashions, lifestyles, tastes and consumer circumstances are factors that are diversifying and stratifying the structure of consumption. In some cases this is taking the form of high-volume but low-value mass market demand, while in others it is involving the emergence of consumption niches for high-priced special, unique or personalized goods and services. There is a wide range of intermediate situations between the two extremes.

We shall now analyse certain current risks and long-term factors in the global economy. Particular attention will be paid to trends in global production and consumption, an understanding of which is essential when it comes to exploring the opportunities for greater participation by the region’s countries in the global economy.

1. The global situation: present risks and long-term factors

The sources of growth look more balanced now than in the 1990s, when the United States was virtually the sole engine of the world economy. Asia has remained highly dynamic, not only in the notable cases of China and India but elsewhere in the region too. Meanwhile, the enlargement of the European Union to take in the Baltic countries and eastern Europe promises a fresh boost to growth in that region. Indeed, the vicissitudes that have recently caused one centre of growth to slow have been counteracted by increased activity in the others.

Second, imbalances have arisen in the world economy as the relative performance and internal make-up of the different centres have shifted. Efforts to deal with these imbalances are generating short- and longer-term risks which are starting to affect the current expansionary cycle of the global economy. Among the chief of these are the potential depth and persistence of the economic recession in the United States as a result of property market developments and their likely repercussions on other sectors and activities. Also of concern is the possibility of a flight to quality among investors as they pull out of riskier assets in response to increased financial market volatility, since this has now started to rise, albeit from historically low levels.[25] A key consideration in evaluating short-term risks is the extent to which the global economy might be able to decouple, at least in part, from that of the United States in the event that the latter experienced an unexpectedly deep or prolonged recession (IMF, 2007).

Third, rising prices for commodities, particularly oil and food, are worrying for two reasons.[26] First, they are causing inflation to rise all over the world and, except in the United States, have given rise to restrictive monetary policies which are not only causing currencies to appreciate but may undermine global growth. Second, rising food prices are increasing poverty and placing millions of people in an unsustainable situation. The restrictions on food exports that a number of countries have started to apply are complicating the picture yet further. Unless countervailing policy measures are taken, there is a risk that the progress made in reducing poverty in recent years may be reversed and that a number of countries may experience political and social strains.

[24] Despite rapid growth rates, these processes can take some time because starting incomes are low. For example, Coca-Cola has invested over US$ 1 billion in introducing its products to China. According to a recent survey, however, spending on soft drinks by rural people in the central areas of China ranges from US$ 0.06 to US$ 0.36 per capita per year, while the price of a bottle of Coca-Cola is US$ 0.30 (Berger, 2006).

[25] To return to the comparison between the recent period and the first phase of globalization, it is interesting to note that while country risk is now at its lowest for 15 years, it still exceeds the “premium” the region’s countries had to pay then (Gerchunoff and Llach, 2008a).

[26] Rising energy prices are among the factors behind higher food prices, owing to their impact on costs in the agricultural sector.

Taking a longer-term view, there are some disturbing factors that could affect the strong productivity growth which has been one of the main underpinnings of this cycle of expansionary global development. There is concern, indeed, that productivity growth in the United States may slow as the powerful early impact of information and communication technologies (ICTs) wears off. Nonetheless, since that economy was a pioneer of the intensive and widespread application of ICTs to production, more widespread and radical use of these technologies ought to boost productivity in other countries, particularly developing ones. This should create the conditions for a rebalancing of the world economy that aids global productivity growth, even with a lesser contribution from the United States over the coming years.

A second disturbing factor is the possibility that the world economy might be less open and competitive in future than it has been in recent years. First, almost no-one doubts that large efficiency gains would arise, particularly in the agricultural and service sectors, if multilateral negotiations in the Doha Round of the World Trade Organization (WTO) were to succeed. The prospects for the Round look poor, however. While bilateral and regional agreements have continued to be signed and now cover a third of world trade, they are no substitute for multilateral negotiations.[27] Again, there is always the fear of a renewed outbreak of protectionism, manifested not only in the constant use of safeguard clauses and antidumping measures but also in ongoing debates about amending the North American Free Trade Agreement or limiting outsourcing in the manufacturing and service sectors along with investment by certain countries in energy, ports and other businesses in industrialized countries. The employment impact of a recessionary cycle in the developed countries would heighten these worrying tendencies (IMF, 2007).

The third factor is the growing likelihood that the constraints now affecting certain critical resources (hydrocarbons, for example) and the environment may end up increasing private- and public-sector costs. Given the growing recognition of the long-term effects of climate change, the countries are considering adopting measures to control carbon emissions over and above those laid down in the Kyoto Protocol to the United Nations Framework Convention on Climate Change.[28] These measures will increase production costs, although they will undoubtedly help to avert the still higher long-term costs of inaction.[29] Another important factor here is the rise in the marginal cost of energy production as yields fall in the deposits that are easiest to work and it becomes necessary to carry out offshore operations and drill for heavier crudes.

The fourth factor that may negatively affect long-term productivity growth is population ageing, particularly in the developed countries. Apart from the rise in the fiscal costs of pensions and health care, the decline in the number of young people entering the labour market has a number of repercussions. First, it will be harder to expand knowledge capital, particularly close to the technology frontier. Second, the mismatch between the skills on offer and those required by the economy will tend to worsen (United Nations, 2007a).

An additional factor is the greater intensity of technological change and its impact on the new methods of organizing production. The convergence and mutual synergy between developments in the digital, biological and cognitive sciences and those of nanotechnology hint at a technological revolution more profound than the convergence of digital technologies alone. This technological dynamic will accentuate the geographical segmentation of production processes by intensifying the trend towards the development of international value chains. It will also tend to drive further outsourcing, offshoring, domestic subcontracting and, in sum, the digitalization and standardization of different phases in the production process. The challenge, then, will be for firms to position

[27] These agreements are less beneficial than broad-based liberalization on the most-favoured-nation principle and may be counterproductive if they are not well designed and implemented (ECLAC, 2006a; IMF, 2007, pp. 22-23; Machinea, 2007).

[28] Only a few countries are expected to meet the goals set for 2008-2012 in the Kyoto Protocol (IMF, 2007, p. 23).

[29] The recent Stern report on the economics of climate change has put the annual cost of stabilizing the atmospheric concentration of carbon dioxide at 1% of global output. Were no measures to be taken, the long-term effect would be a reduction of 5% or more in global consumption, mainly affecting tropical countries with low per capita incomes (Stern, 2006).

themselves in those segments of the value chain which offer the greatest scope for differentiation and where the intangibles of quality, timeliness, branding, traceability and safety, among others, play the greatest role in competitiveness.

Anticipating and modelling the effects of these factors on long-term global development is clearly a difficult task. Nonetheless, it is helpful to consider them well in advance so that well-calibrated public policy responses can be prepared, ideally in concert with the private sector. In summary, besides the short-term risks, about which there is mounting concern, and the factors that might affect the medium term, the most likely scenario is that the structural changes experienced will prolong the expansionary cycle for an intermediate period. In particular, the forecasts are for commodity prices, and thus the region’s terms of trade, to remain high by comparison with recent decades and for remittances, some adverse shocks notwithstanding, to remain an essential source of external financing in a number of the region’s countries. The dynamic of technological change will intensify, and permanent monitoring of its repercussions on global and regional trade and investment flows is therefore becoming a vital task for the economies of Latin America and the Caribbean.

2. Changes in the global production structure

Rising productivity is the engine of globalization and stems from the emergence of new technologies and faster development of existing ones, factors that have significantly altered the way production is organized in firms, production sectors and, ultimately, the global economy. Of all new technologies, information and communication technologies (ICTs) have had a particularly powerful impact in the developed economies, especially the United States (see chapter IV). The spread of ICTs is not only raising the productivity of existing businesses and creating new ones, but is also increasing the commercialization of goods and services as it accelerates the geographical fragmentation of production processes. Thus, innovation is not just affecting technologically advanced sectors; the whole spectrum of production is being dynamized by its application. In turn, the effects of these innovations in the rest of the world have been enhanced by international trade liberalization policies and capital movements, which have contributed to the rise in productivity over the last two decades.

New technologies have led to improvements in quality, accuracy and compatibility between products, and this has yielded substantial reductions in unit costs for a given quantity. Particularly important is the “non-rival” character of many digital goods and services, as it has opened the way to virtually unlimited economies of scale.

The cost reductions resulting from these innovations have allowed markets to expand to global proportions. At the same time, economies of scale have taken on increasing importance in companies’ cost functions. Both processes have been enhanced by the trend towards homogeneity in the preferences of ever larger groups of consumers. All this has resulted in an expanding market for products capable of meeting this type of demand on the basis of intensely competitive pricing. The consequence has been a growing tendency towards technological uniformity which, combined with more homogeneous preferences, has led to the emergence of global consumers in a market that is also global and is dominated by economies of scale.

This development has changed competition conditions in a large number of markets. In particular, fixed cost competition has replaced variable cost competition. Production, particularly of manufactures, is now heavily weighted towards fixed costs.[30] Of course, this does not mean that variable cost competition has disappeared, only that its relative importance has diminished.[31]

[30] For example, the initial cost of a semiconductor manufacturing plant rose from US$ 1billion in 1980 to US$ 2 billion in 2000 and US$ 3 billion in 2005 (Berger, 2006).

[31] Increased labour market flexibility, to the extent that it has reduced wage costs, is continuing to decrease the share of variable costs, which in some branches of manufacturing accounted for no more than 10% of total costs in the 1990s, as against some 25% two decades earlier (Oman, 1994).

In particular, the development of global brands and intensifying product and process research and development efforts have contributed substantially to the rise in companies' fixed costs and forced them to increase the scale of production. Thus, economies of scale in research and development and in marketing have combined with economies of scale in production to give rise to global producers struggling for sufficient market share to cover their fixed costs. This process is reinforcing the trend towards larger markets, even as the organization of production there changes.

Larger markets and flexible production have resulted in greater economic concentration. Global oligopolies are now the dominant form of organization in the supply configuration of most industries with a large technological research and development component and in manufacturing branches with large economies of scale. The ubiquity of oligarchic structures is the result of efforts to capitalize on economies of scale in production, commercialization and technological research and development—an even stronger force for market expansion than new technology.

There is a tendency towards concentration even when firms are in a position to use commercial or technological development strategies to differentiate their products. The fact is that when differentiation is pursued through irrecoverable expenditure on advertising or a new brand image, or on the development of a particular type of technology, production scales increase. As a result, some firms grow bigger and the market structure becomes even more concentrated. Thus, market expansion means that differentiation efforts which were unprofitable in smaller markets become viable. Strategies for creating and defending global brands and competing on the basis of technological progress are typical not only of technology-intensive activities but also of marketing-intensive ones, even when their technology level is intermediate or low, as in the case of Wal-Mart. These processes also account for the great concentration of supply structures for certain products such as processed food and beverages that are not technology-intensive (Sutton, 1991 and 1998).

Consequently, there are forces that are tending to increase average company size and concentration, both in markets for homogeneous products and when differentiation is the aim. Up to a point, this seems to run counter to the characteristics of flexible production, with its potential for smaller production runs and personalized products. But while production runs do tend to be smaller in businesses selling non-homogeneous products, there is no corresponding tendency for the economic size of firms to decline. Only large companies can directly produce, or coordinate global systems capable of supplying, a large range of products. In these cases, economies of scope are usually significant, but they are only available to firms or systems enjoying major economies of scale.

(a) Corporate strategies and value chains

Corporate strategies explain why large firms, particularly transnationals, are now the leading economic actors. These firms have built up global systems through new investment, mergers and acquisitions. However, the way they organize production has been changing. Until the 1970s, firms responded to the appearance of new markets and the expansion of existing ones by organizing production on the basis of the Taylorist-Fordist paradigm, giving rise to vertically integrated businesses.[32]

Under the Taylorist-Fordist paradigm, firms carried out fairly similar activities at different locations with little attempt at coordination (Porter, 1986). As economies of scale increased, the global market came to be served from one or just a few locations, while falling coordination costs meant that corporate strategies were gradually oriented towards the distribution of activities around a number of locations (Hamel and Prahalad, 1985). Latin America is a location for activities or

[32] The larger these firms were, the greater the pressure to eliminate idle capacity and the stricter the quality controls on the inputs purchased. This generally led the firm to expand into a wide range of ancillary activities at the beginning or end of the production chain. For example, by 1949 the Ford Motor Company had bought iron ore and coal mines in Michigan, West Virginia and Kentucky and owned its own railways, a rubber plantation in Brazil and cargo ships to carry parts to its factories overseas (Chandler, 1990).

segments forming part of global production chains in different industries (agroindustry, cars, electronics, textiles) and services.

A global value chain comprises a sequence of related and dependent activities required to take a product or service from conception through to recycling or disposal, via the different stages of production, marketing and after-sales services (UNIDO, 2004 and UNCTAD, 2007a). Thus, value chains are complex entities in which production activities are just one of the places where value is added to the product and which also include a wide range of related and interdependent activities within or between their links (Gereffi, Humphrey and Sturgeon, 2005). Analysis of the patterns prevailing in value chains helps towards an understanding of the obstacles and opportunities that will arise as production sectors in Latin America seek to transform their structure by incorporating greater knowledge and value added.

In analysing a value chain, the system of governance is an essential factor. This means the functions of key actors (lead firms) that make themselves responsible for the division of labour between companies within the chain and manage the coordination between its different links (Gereffi, Humphrey and Sturgeon, 2005).[33] The lead firms exercise their governance power by specifying the product and controlling what is to be produced, how, by whom (Gereffi, Humphrey and Sturgeon, 2005), when and in what quantities, and at what price it is to be sold (Humphrey and Schmitz, 2001). Meanwhile, the power relationships expressed in the different forms of governance help determine the distribution of revenues and flows of knowledge along the chain, with implications for local innovation and development potential. The firms coordinating the different global value chains are situated at their most vital and profitable nodes, whence they mobilize all the member firms to organize global production and distribution (Kaplinsky, 2000).

One classification is based on governance, with chains being categorized as producer-driven or buyer-driven. Classic examples of the former are the automotive, aerospace, electronics, semiconductor and heavy machinery industries, these being capital- and technology-intensive sectors. Transnational firms owning recognized brands are firmly entrenched in the most concentrated and profitable segments of these global value chains and have placed solid barriers to entry in the way of other firms, while exercising control over both backward (raw material and component suppliers) and forward (distributors) linkages (Gereffi, 2000).

In various other sectors, such as textiles, garments and foods, a large proportion of global production and trade are led by firms that are not themselves producers but carry out design, standard-setting, marketing and logistics functions, the so-called “manufacturers without factories” (Gereffi, 1999). Some of these global buyers (major distributors and supermarkets) have become leading players in world trade. Even by the early 1990s, for example, large distributors and firms owning established brands were responsible for 70% of clothing imports into the United States (Feenstra, 1998).

From the same perspective, but going by the relationships established in value chains, it is possible to detail four systems governing ties between firms:[34] (i) autonomous market relationships; (ii) partnerships between firms with complementary and mutually dependent capabilities; (iii) quasi-hierarchical relationships and (iv) hierarchical relationships (Humphrey and Schmitz, 2002). These different forms of governance in global chains are all part of a continuum, with the market mechanism at one of the two extremes (approaching a situation in which there is no coordination or governance at all) and vertically integrated firms at the other (Gereffi, Humphrey and Sturgeon, 2005).

In autonomous market relationships, there is no personal link between seller and buyer and the commercial bond consequently resembles the theoretical model of perfect competition. This arrangement tends to prevail in the commercialization of standardized goods, when the global value

33 See Hilbert, López and Vásquez (2008) for an analysis of the different characteristics of value chains and their forms of governance.
34 This is the classification used in chapter V to analyse the value chains found in the region.

chain does not require great coordination, there are convenient ways of valuing products (such as global cereal or metal exchanges), supplier supervision is straightforward or unnecessary and there are substantial economies of scale. Commodity exporting often provides a clear example of this type of global market participation.

When products need to be personalized to meet consumer requirements, a supplier's performance is hard to monitor or a product cannot easily be valued, buyer and seller need to interact more closely to decide what, how and when to produce, and this raises transaction costs. At the extreme, the arrangement that minimizes these transaction costs is to do everything in-house, i.e., establish hierarchical relationships involving explicit coordination between all the parties, in accordance with an integrated production line logic. This is the vertical integration model traditionally adopted by transnational enterprises.

There are other possible arrangements between the two extremes, however. Captive supplier networks are one.[35] Under this arrangement, suppliers are heavily dependent on just one or a handful of buyers, to which their relationship is usually like that of subsidiaries of a single industrial group. The admission process for a new supplier is long and complex and network entry costs are very high. Again, production networks may be based on interactive relationships. This system of governance is embodied in more complex ties between buyers and sellers, frequently leading to mutual dependency and asset specificity. These relationships are based on trust and reputation, or on family and ethnic ties. They entail cooperation between equals, particularly in technological matters, and a highly sophisticated division of labour.[36]

An example that is interesting because of its relevance to the region is agroindustry, in which multinational firms acting under a system of governance dominated by the market and quasi-hierarchical relationships have established themselves at the critical points of the chain and coordinate relationships and technology flows between the different agents in the complex. These firms, along with large international commodity market operators, are leading suppliers of biotechnology inputs.

The ability to manage the chain depends on control of the commercialization network or some complementary technological asset. The latter is the case with large transnational enterprises that own patents on genetically modified seeds. In soy production, for example, control of Roundup Ready (RR) seeds meant that growers had to use bespoke herbicides and fertilizers produced by the same firm and also determined the production process, i.e., what was sown, how and where. On top of this, the owner advanced the financing needed for planting. Thus, thanks to its ownership rights, the transnational enterprise was able to control and appropriate the benefits of much of this value chain. Another example is the Pink Lady apple variety, which was patented by the Government of Australia and is now being strongly promoted in the European market. Any local producer wishing to enter the chain needs to buy the seedlings, use the registered trademark, produce to predetermined standards and sell in authorized markets. In this case, too, control of a strategic input provides control over much of the value chain without the need to participate directly in the production of the item concerned. In the above examples, control is based on technology as a key asset of the chain, but much the same happens with other key components such as financing and certain management capabilities. In none of these cases does much fixed capital have to be put at risk to exercise control (Bisang, Campi and Cesa, 2007).

[35] These arrangements are typical of international production networks led by flagship firms in Japan and the Republic of Korea (Aoki, 987).

[36] Such relationships are characteristic of certain regions in countries of the European Union (particularly Germany and Italy), of Chinese family firms situated in other East Asian countries, and of firms located in areas close to global fashion centres (Los Angeles, New York, Paris and Turin).

(b) Prospects for upgrading

Access to developed country markets increasingly comes through participation in chains that are dominated by transnational enterprises based in those countries (Gereffi, Humphrey and Sturgeon, 2005). The different governance structures described are important because they help determine not only revenue levels but also prospects for admission and upgrading in the value chains which characterize today's production landscape. These issues are particularly important for the production development strategies of developing countries.[37] Chapter IV analyses the region's participation in the global value chains of the agroindustry, mining, manufacturing and service sectors, and opportunities in each.

In practice, upgrading opportunities in global value chains may derive from a variety of sources. Sometimes the impetus comes from manufacturer- or distributor-governed chains themselves. The development history of the Asian tigers offers excellent examples of such progress in different value chains.[38] A number of these countries started out as original equipment manufacturers and became own-brand manufacturers, sometimes through upgrading in the area of global logistics contracting (Fang Brothers Group) and sometimes in the area of own design and manufacturing (Samsung).[39]

The structure and dynamism of the market served by a value chain can also stimulate innovation in its member companies (UNIDO, 2002). Generally speaking, low-income markets with a high level of price elasticity tend to stimulate process innovation, since competition is mainly on price, while high-income markets stimulate product innovation and also functional innovation in pursuit of advantages in market niches that are more specialized or more closely tailored to specific consumer needs (personalized goods).

These opportunities for admission and upgrading are obviously dependent on the technological capabilities countries succeed in developing in different production sectors. These capabilities encompass the technical, managerial and organizational skills firms need to develop in order to make use of plant and information in processes of technical change. Thus, learning processes play a central role and the firms leading chains are not always willing to transfer knowledge (Morrison, Pietrobelli and Rabellotti, 2006). Opportunities for participation in a global chain depend on how revenues and the power of knowledge are distributed. This being so, it is vital to be able to identify each country's unique (or at least scarce) competitive advantages in the global context.[40]

Pietrobelli and Rabellotti (2007) examined these issues in a large number of production clusters in Latin America and the Caribbean. Some important conclusions emerge from the case analyses (Hilbert, López and Vásquez, 2008). First, value chains have a variety of organizational forms and governance structures, with differences between sectors. In traditional manufacturing and resource-based industries, firms tend to join global and local chains under different governance arrangements, with quasi-hierarchical relationships predominating in global networks and market relationships in local (i.e., national or regional) networks. Conversely, the other two sectors, namely complex product systems and goods from specialized suppliers, do not show so much variety in their forms of organization: firms in the former participate almost exclusively in global chains under

[37] The specialist literature recognizes four types of innovation: process innovation (reorganizing the production process or improving the technology used), product innovation (developing products with a greater unit value), functional innovation (switching to functions that require greater technological, managerial and organizational capabilities) and lateral innovations (taking the capabilities acquired in one value chain and applying them in others). See UNIDO (2002).

[38] The literature on these matters is very extensive. Studies include UNIDO (2004), Humphrey and Schmitz (2002) and Sturgeon and Lester (2002).

[39] These routes to progress in global value chains are increasingly being blocked off by established firms to prevent competitors from emerging. Sony, according to Teruaki Aoki, a Senior Executive Vice President of the company until 2005, uses different suppliers for each component to avoid creating competitors. If suppliers were used as original design manufacturers, they would be able to do everything, so Sony has to "black-box" its product technologies (cited in Berger, 2006).

[40] See section D of this chapter and chapter V, which gives a detailed analysis of the achievements of the Latin American and Caribbean countries in the different production activities and the challenges facing them.

quasi-hierarchical or network membership arrangements, while firms in the latter participate in local networks under governance systems based on market relationships or network membership. In none of the four sectors are governance arrangements based on hierarchical structures (subsidiaries of transnationals) much in evidence.

Second, the integration of traditional and resource-based manufactures into global and local networks offers two differentiated ways of improving firms' capabilities. Participation in global chains provides a way into the international market, where greater requirements tend to be imposed on local producers. Since global buyers depend on the capabilities of local producers, they have to help them improve products and processes, especially when quasi-hierarchical governance structures are operating in the early stages of the relationship. Participation in local chains provides opportunities to improve firms' capabilities owing to the lesser concentration of sales and buyers, the ability to sell directly using their own representatives, and increased responsibilities in the spheres of design, branding and product distribution.

Lastly, the characteristics of the learning process in each sector and the role of the lead companies in global chains have differentiated effects on the various procedures whereby firms are upgraded. For one thing, the collective efficiency of each production cluster is a factor of great importance in traditional manufacturing, resource-based manufacturing and specialized supplier sectors; conversely, it is not very important in the case of complex product systems, which are more affected by the operating logic of their own global chain.[41] In all sectors, the evaluation of the case studies carried out by the authors indicates that product and process upgrading is much more common than functional and transversal upgrading.

To conclude, it should be stressed that the development of production clusters is a dynamic process, as are the participation of their firms in global and local networks and the governance structures of value chains. Consequently, there will always be scope for improvement by combining private and public efforts to develop greater local capabilities, explore new market opportunities and participation methods, and progress with the internationalization of local firms.[42] As mentioned, it is these opportunities for Latin America and the Caribbean that are analysed in chapter V.

3. Changes in global demand

To complete this overview we need to look at changes in demand, particularly those affecting its scale and stratification. One of the essential characteristics of the last quarter century has been the globalization of the workforce. The effective global labour force is estimated to have increased fourfold, and this trend is expected to continue over the coming years, with a further doubling possible by 2050 (IMF, 2007).[43] About half this increase has originated in East Asia, especially China, with South Asia, especially India, and the countries of eastern Europe contributing to a lesser degree. This workforce has two avenues of access to the developed world: goods and services imports and, to a much lesser degree, immigration, which is still restricted in virtually all developed countries.

41 The collective efficiency of a production cluster is calculated as a linear combination (with equal weightings) of two variables: external economies (availability of specialized labour, the diffusion of specific information and market access and knowledge) and joint actions (in the areas of technology, financing, the adoption of standards and market testing). See Pietrobelli and Rabellotti (2007, chapter 9).

42 OECD (2007a) uses the value chain methodology to identify bottlenecks that limit or block the beneficial participation of individual countries. The methodology sets out to "dissect" each value chain by identifying problems and actors at each stage in order to suggest changes in different aspects of sectoral and regulatory policies.

43 This estimate is based on a simple measurement that consists in weighting each country's workforce by the ratio of exports to gross domestic product. On this measure, the globalized workforce quadrupled between 1980 and 2005.

(a) Potential consumption growth

The integration of workers from certain developing countries into the global workforce has brought great benefits for the developed economies and the rest of the world, although there have also been some problems for the unglobalized part of the workforce and their own exports. It has brought import prices for manufactured goods down sharply, while allowing global value chains to operate more efficiently. In turn, the developing countries involved have seen wages rise in the manufacturing sector, and in some cases local economies have expanded strongly. Since each worker is also a consumer, the current economic expansion in these countries points to strong demand growth. This is leading to unprecedented mass consumption of a variety of consumer goods.

Povery reduction among huge sections of the population, on a scale never before seen in human history, has increased demand for and thus trade in products in the food and agriculture complex and other commodities (see box I.3), so that this trend is expected to continue over the coming years. The consequence has been a rise in the prices of these products which, fluctuations aside, will remain at levels substantially higher than in recent decades.[44]

In the particular case of China, the growth in demand from urban-affluent consumers has been striking. These consumers account for an average of about 10% of disposable urban income, even though they represent just 1% of the total population. Their consumption is oriented towards global luxury goods brands and is largely confined to the major cities. However, the greatest changes are yet to come. While 77% of Chinese households now live on an annual income of less than US$ 3,000 at 2000 prices, this percentage is expected to fall to 10% by 2025, with China's urban consumers coming to form one of the world's largest markets.[45]

Economic projections based on the McKinsey Global Institute econometric model, drawing on the database of China's National Bureau of Statistics, show two surges of strong growth in the country's middle class, involving different income strata.

In the first surge of growth, the lower middle class will emerge by 2010 and be composed of households with incomes ranging from US$ 3,000 to US$ 5,000 a year at 2000 prices which, adjusted for purchasing power parity, will be equivalent to US$ 9,600 and US$ 16,000, respectively. This lower middle class will contain 290 million people and represent 44% of the urban population by 2010. Its share of urban income will peak in 2015, when it will represent purchasing power of US$ 600 billion. In the second surge, an upper middle class will emerge by 2020, with annual incomes ranging from US$ 5,000 to US$ 12,500 at 2000 prices, equivalent to US$ 16,000 and US$ 40,000 when adjusted for purchasing power parity. By 2025 this group will contain 520 million people and represent more than half the urban population, with purchasing power of US$ 1.7 trillion.

Even if today's high family saving rates (25%) are maintained, urban consumption is expected to grow by 8.7% a year up to 2025.[46] As in the rest of the world, consumption patterns are changing as incomes rise, to the detriment of basic goods. Everything seems to be happening faster in China than in other developing countries, however. Table I.4 presents projections for spending up to 2025. Although the total spending share of some components such as food diminishes, very high rates of growth are still expected (6.7% a year).[47]

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44 Added to this is the increased demand resulting from biofuels.

45 It is calculated that available income in that market will be US$ 2.5 trillion by 2025, almost as much as that of all the households in Japan (US$ 2.7 trillion in 2004, according to OECD data). Adjusted for purchasing power parity, this would be equivalent to US$ 8.7 trillion, making China's consumer market larger than that of the United States (US$ 7.6 trillion in 2004, according to OECD data) (Farrell, Gersch and Stephenson, 2006).

46 It is reasonable to expect the family saving rate to fall as social protection systems are established, especially for pensions and health care.

47 According to World Tourism Organization data, 50 million Chinese already earn enough to travel abroad, and there are expected to be more than 100 million tourists by 2020 (WTO, 2005).

Box I.3

THE DYNAMISM OF WORLD TRADE

In the 1985-2006 period, world output grew at an annualized rate of 3.1% in real terms, while world merchandise trade grew at 9.8% a year. However, the dynamism displayed by the different categories of goods varied greatly by their technology intensity. As has traditionally been the case, the most dynamic exports were of goods with a higher technology content (high-technology goods saw annualized growth of 12.4%) while the least dynamic category were commodities, whose annualized growth rate was 8.3%. Low- and medium-technology manufactures experienced a similar growth rate, slightly above resource-intensive manufactures and well below high-technology manufactures (see table below).

When the period is divided up into different subperiods, considerable differences are seen as regards the relative dynamism of the different categories of goods. In the first five-year period, 1985-1990, high-technology goods grew at a rate of 18.8% a year, while commodities and resource-based manufactures experienced a growth rate of 10.8%. In the latter years, however, commodities and resource-based manufactures became more dynamic than high-technology goods, growing at a rate of 12.5% a year (11.7% if oil and its derivatives are excluded), as against a rate of 9.2% for high-technology manufactures. It is evident that the higher growth in trade in commodities over recent years has been connected with rising prices for these. In other periods, conversely, particularly the 1990s, low export growth rates for commodities and manufactures based on them were partly due to falling prices.

GROWTH IN WORLD MERCHANDISE EXPORTS, BY TECHNOLOGY INTENSITY, 1985-2006

	Annualized growth (percentages)				
	Whole period	Subperiods			
	1985-2006	1985-1990	1990-1995	1995-2000	2000-2006
All products	9.8	14.9	8.5	5.2	10.6
Commodities	8.3	8.3	3.5	8.2	12.4
Resource-based manufactures	9.3	13.1	7.6	3.5	12.6
Commodities + resource-based manufactures	8.8	10.8	5.9	5.4	12.5
Low-technology manufactures	9.7	18.9	8.8	2.8	9.0
Medium-technology manufactures	9.5	15.8	8.1	3.5	10.6
High-technology manufactures	12.4	18.8	13.7	9.1	9.2
Oil, oil derivatives and the like	9.5	5.6	0.0	18.4	14.3
Commodities + natural-resource based manufactures, excluding oil	8.5	12.7	7.4	1.9	11.7

Source: United Nations Commodity Trade Statistics Database (COMTRADE).

Table I.4

PROJECTIONS FOR URBAN CONSUMPTION IN CHINA

(Billions of 2000 dollars and annualized percentages)

	Consumption		Growth
	Actual 2004	Projected 2025	
Food	147	574	6.7
Education and leisure	61	410	9.5
Transport and telecommunications	54	350	9.3
Clothing	44	159	6.3
Housing and basic services	39	398	11.8
Health services	31	310	11.6
Household durables	27	103	6.6
Personal care products	14	93	9.3

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of “Serving the new Chinese customer”, *The McKinsey Quarterly*, special issue, 2006, p. 67.

To conclude this brief analysis of China, notice should be taken of some of the difficulties the rest of the world faces in penetrating this huge market. First, it will continue to be highly dispersed among cities of various sizes over the coming years; second, the current exchange rate means that goods produced in the rest of the world, and even those with imported components, will have serious trouble competing with locally produced goods. This problem is compounded by ignorance of the idiosyncratic factors that have to be taken into account when participating in this market. The lure is so strong, however, that a number of transnational enterprises are trying out different strategies in the country, which has such enormous potential and will change so much in the coming years.[48]

(b) Diversifying consumption

Looking at the global situation, it is important to realize that the increasing stratification of global demand is also a source of opportunity. As income levels rise and diversify, the demand for product variety, quality and novelty will strengthen and there will be scope for serving different regional and local tastes. Product differentiation can yield competitive advantages in particular market niches or segments, some of which may be highly profitable for non-global firms (Mariti, 1993); these firms have some advantages over their globalized competitors, particularly their superior ability to monitor changes in local markets and the potentially greater flexibility of their operations.

As noted earlier, some changes in the global production structure have contributed to far-reaching market fragmentation, not only in manufacturing industry but also for basic inputs and services. Product segmentation is now taking place very actively in virtually all sectors, in two main directions: from standardized to differentiated products, and from basic to personalized products (see figure I.3).

Figure I.3
MARKET SEGMENTATION

Organic vegetables Special steels Adventure tourism	**SPECIAL**	**SPECIALIZED MARKET NICHES**	**UNIQUE**	Blue Mountain coffee Nanotechnology instruments Tourism in the Vatican
Cereals and ores Car parts Beach tourism	**BASIC**	**STANDARDIZED MARKETS**	**PERSONALIZED**	Diamonds for jewellery Dell personal computers Health-care tourism

Source: Prepared on the basis of Carlota Pérez, "Constructing a vision for Latin America: Using the natural resource endowment as a platform for a technologically dynamic and socially cohesive future", Santiago, Chile, 2008, unpublished.

By innovating intensively, developing countries can not only participate in mass markets as they always have done, but can enter a number of these market niches with a wide range of goods and services that may include hand-made ceramics and biotechnology diagnostic packages, long-

[48] For example, Procter & Gamble is currently offering inexpensive Olay skin care and cleaning products in supermarkets and hypermarkets and more sophisticated products in the range, such as Olay Regenerist, in specialist shops. Generally speaking, firms are trying to offer a wide enough variety of products to keep pace with consumers as their income levels rise (Farrell, Gersch and Stephenson, 2006).

distance services that include not just call centres but also the interpretation of geological information and medical diagnostics, and similar opportunities in the food products and specialized tourism sectors (Pérez, 2008).

One interesting aspect of this market fragmentation is the small-scale production opportunities it opens up. Many specialist shops and even supermarkets and large stores in developed countries have now taken to selling small quantities of a great variety of different products, the better to respond to the diversity of consumer tastes. There is also an easy way of reaching these markets: global mail companies can now deliver merchandise anywhere in the world at affordable prices and as often as needed.

International experience also shows that it is possible to maintain these market niches not only in sectors that are unattractive to global firms, but also in areas where "disadvantages of scale" are offset by the flexibility of similar firms interacting in networks governed by different forms of association. This also happens when product differentiation is achieved by increasing variable production costs. Thus, in furniture production, differentiation can be obtained by using better-quality wood or paints, or by putting more labour into each unit produced.

In summary, changes in the organization of global production and the corresponding mass expansion and stratification of consumption are creating avenues for the exploration of new economic participation strategies in developing countries. Obviously there is no one-size-fits-all formula or solution applicable to all cases. With more innovative actions and attitudes, it should be possible to improve on almost everything that is now being done and identify hitherto neglected opportunities. The following section will analyse the different opportunities available to Latin America and the Caribbean.

D. A new opportunity for Latin America and the Caribbean

Without question, the last few years have been a time of remarkable growth in the global economy. This growth has been accompanied by profound structural changes owing to the rapid industrialization of much of developing Asia, particularly China and India, together with a number of eastern European countries and some former members of the Soviet Union, a development that has substantially improved Latin America and the Caribbean's terms of trade. The recession that has now begun in the United States may threaten the continuity of the global cycle of expansion, at least for the rest of 2008. Everything seems to indicate, though, that developing Asia will carry on expanding and consequently that demand for natural resources will remain strong, as will prices, which, with some fluctuations, can be expected to remain at levels considerably higher than those of recent decades.

It is interesting to compare the effects of all this on the region's terms of trade with those observed during the second half of the nineteenth century and the early part of the twentieth. In that period, the region benefited greatly from rising global demand for its products, at a time when the industrialization of western Europe and falling local and international transport costs were also driving substantial improvements in the terms of trade (see box I.4).

In comparing the two periods, however, it is also necessary to consider the differences between them. First, the export patterns of the Latin American and Caribbean countries are more differentiated now than they were then and, consequently, better export prices for commodities do not benefit all the countries alike (see chapter II). The positive effects have been very marked in South America because of the degree to which it specializes in exports of natural resources, but the external sales of Mexico and Central America largely consist of manufactured goods that are having to cope with competition from China and other Asian countries in the United States market, where prices have softened. In addition, Central America and much of the Caribbean are net importers of hydrocarbons. Because of these factors, the two subregions have seen their terms of trade deteriorate in recent years. The situation of Mexico is midway between the two since, in addition to manufactures, it exports large volumes of hydrocarbons and other natural resources.

Box I.4

TERMS OF TRADE IN THE TWO PHASES OF GLOBALIZATION (1850-1914 AND 1990-2007)

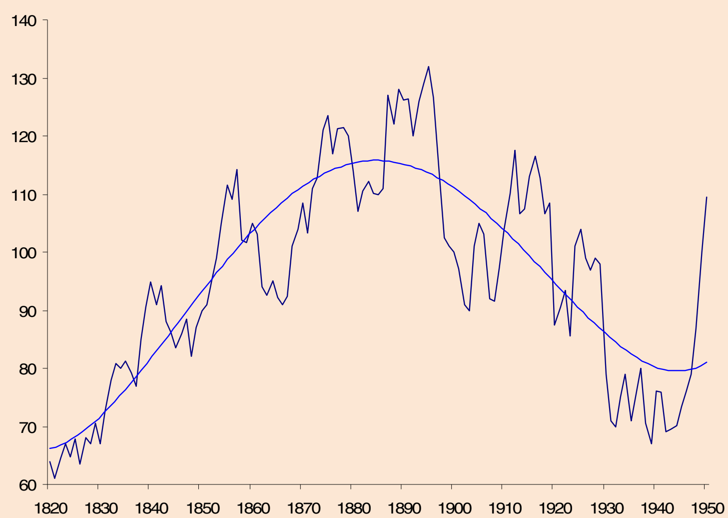
It has become a commonplace of economic history in recent years to see the period before the First World War as foreshadowing the current phase of globalization. Large-scale international goods and factor movements are a central feature of both periods, particularly when this dynamism is contrasted with the situation between 1914 and 1991, the "short twentieth century", as Hobsbawm (1995) calls it. The comparison between the 1850-1914 period and the one beginning in 1991 raises a number of issues. In this box, which is based on Gerchunoff and Llach (2008a), the focus is on the dynamic of the terms of trade.

Between 1850 and 1913, the region's exports increased almost tenfold in current dollar terms, while at constant values they grew by some 4% a year. European exports, meanwhile, were growing at 3.3%. In that period, the ratio between Latin American and European exports rose from 0.12 to 0.17, showing how fast Latin America was integrating into a world of rapidly expanding international trade. The graphic shows that Latin America's terms of trade in the 1810-1940 period described an inverted U-curve (Williamson, 2006).

Because the chart uses London prices, however, it does not fully capture the improvement in the terms of trade from the standpoint of Latin American producers.[a] A characteristic feature of the period is the peculiar relationship between sharply falling transport costs, rising trade and shifting terms of trade. Lower transport costs for goods are equivalent to higher productivity, which shifts the international supply curve for the product concerned outward, lowers its prices and increases the volume of demand.[b] Like a change in productivity, a reduction in transport costs leads simultaneously to higher output in the remoter producer countries and lower international prices. In this period, in fact, the international price after transport costs rose, creating an opportunity for many Latin American products. The extent of this opportunity was determined by the proportional cost reduction, which depended on the weight of the product concerned and the distance to be covered (the greater the weight and distance, the greater the percentage cost reduction).[c]

LATIN AMERICA: TERMS OF TRADE, 1820-1950

(*1990=100*)



Source: John H. Coatsworth and Jeffrey G. Williamson, "The roots of Latin American protectionism: looking before the Great Depression", *NBER Working Paper*, No. 8999, Cambridge, Massachusetts, June 2002.

Box I.4 (concluded)

In the current phase of globalization, falling transport costs have played a smaller role than the widespread adoption of trade liberalization policies, something that happened in Latin America but also the countries that were formerly in the Soviet sphere of influence, plus China and India. This has had an enormous influence on the region's terms of trade, which followed a highly favourable trend from the early 1990s until 2007, although not all the countries benefited alike (ECLAC, 2007a). As a rule, South America's terms of trade rose, as to a lesser extent did Mexico's, not only because real commodity prices were rising but also because real prices for manufactures were coming down. Thus, the appearance of the new global actors has had two simultaneous effects on the region's terms of trade, increasing both the demand for the goods it exports and the supply of those it imports.

Although it is not always helpful to seek lessons in history, the comparison presented here may make it easier to grasp the essence of the developments these situations involve.

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of Pablo Gerchunoff and Lucas Llach, "Antes y después del 'corto siglo XX': dos globalizaciones latinoamericanas (1850-1914 y 1980-2000)", 2008, unpublished.

[a] By 1850 the industrialization of the European continent was fully under way, but the new transportation technologies had not yet spread to any significant extent: the length of railway track laid in the world and in South America was less than 4% and 1%, respectively, of what it would be in 1910.

[b] In the case of goods from remoter areas, demand basically increases at the expense of output in other regions, particularly the importing countries. This accounts for the rise in European protectionism in the second half of the nineteenth century, which has continued down to our own times.

[c] In the region, the heaviest products came from Canada, Chile and Argentina, in that order. To give an example, the profit margin of an Argentine producer situated 200 kilometres from a port could improve by more than 40% without any change in the international price.

Second, in the nineteenth century the region was the destination for large flows of migrants from Europe and other continents, while the movement now is the other way, as Latin America and the Caribbean have turned into net exporters of labour. This exodus has been matched by a continuous rise in family remittances, now totalling some US$ 60 billion (see chapter II).[49] Indeed, Mexico is one of the world's largest recipients of family remittances, and in several of the region's countries these have become the main source of capital inflows, far exceeding foreign direct investment. In the smaller countries of Central America and the Caribbean, family remittances represent large percentages of national output (upward of 15%).

As was noted in relation to natural resources, revenue from family remittances to the region's countries can be expected to continue at levels similar to those of recent years, although they may be affected by the recession in the United States.

There are many other differences between the two cycles, of course, but this is not the place to analyse them. However, it is worth emphasizing some developments already discussed in this document: the intensity of technological change, the emergence of aggressive new competitors from the developing world with a growing stock of technological know-how, the impressive network of trade agreements that is being developed and the new links between trade, investment and innovation as a result of technological change and the new forms of corporate and productive organization. These constitute major differences from the globalization cycle of the late nineteenth century.

1. The regional situation

The region's countries have succeeded, each through different mechanisms, in capitalizing on the new conditions characterizing this phase of the global development cycle. As already mentioned, global growth in recent years has been solid and has spread to a broader array of countries. According to the information available, per capita output has been rising by over 3% a year in 96 countries out of a total of 159, including 63 developing countries, while growth rates have been negative in only 9 (United Nations, 2007a). While the Latin America and Caribbean region has grown by less than others in the developing world, by the end of 2008 it will have been

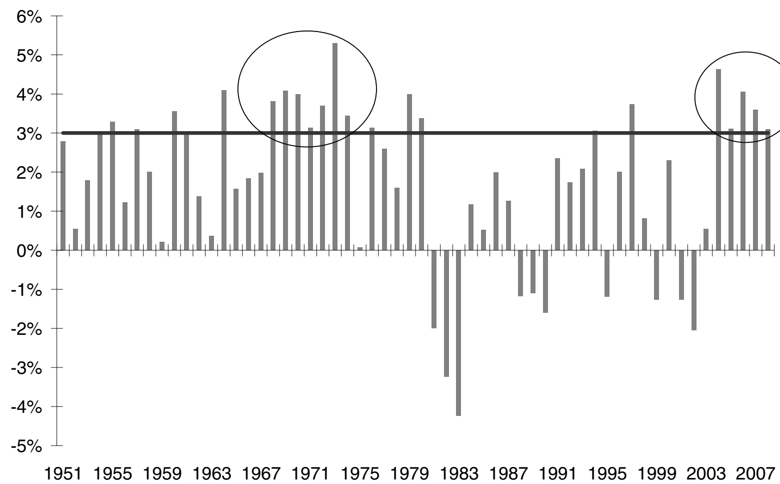
[49] It is also clear that the extraordinary growth of family remittances, which have risen 60-fold since the early 1980s, has been facilitated by the development of the financial system and of information and communication technologies.

expanding for six years with average per capita output growth of a little over 3% a year (see figure I.4).[50] Those six years will have been the longest-lasting and strongest period of expansion since 1980 and only the second since 1950 to have had such high growth rates.[51]

Figure I.4

LATIN AMERICA AND THE CARIBBEAN: PER CAPITA OUTPUT GROWTH, 1950-2008

(Annual growth rates at 2000 prices)



Source: Economic Commission for Latin America and the Caribbean (ECLAC).

As a number of recent ECLAC studies have pointed out, the current phase of economic expansion is not only characterized by higher and more stable growth rates over a relatively prolonged period, but also reflects responsible macroeconomic management and higher-quality growth, for a variety of reasons (see ECLAC, 2007c and 2007d). First, the balance-of-payments current account has been consistently in surplus since 2003; second, fiscal policy has usually been designed to yield a primary surplus, leading to a considerable reduction in public debt as a percentage of national output; third, external vulnerability has declined steadily as a result of the large reductions in external debt and increased international reserves; fourth, the pick-up in inflation in 2007 notwithstanding, general price stability has been preserved and governments have opted for flexible currency regimes, although this has created a dilemma (often hard to resolve) between the degree of monetary latitude that has to be sacrificed and the amount of currency appreciation that can be tolerated; fifth, workforce participation has risen and unemployment has fallen, in differing proportions depending on the year and country; sixth, national saving has been growing and financing rising levels of investment, since the gross capital formation ratio in 2007 was the highest for 25 years, albeit still below its peak of the 1970s; and seventh, international demand has held up strongly, underpinning a 7.4% annual increase in the physical volume of goods and services exports, although imports have grown even faster, by about 11% a year (2000 prices are used in both cases).

So far, though, this good macroeconomic performance has not led to the kind of productive transformation that would substantially alter the way the region's countries participate in the global economy. This is unsurprising since, while prudent macroeconomic management is an essential ingredient in any international strategy, it is not enough on its own and has to be supplemented by active policies to promote and diversify exports, foment and spread technology, stimulate

50 The regional growth rate is strongly influenced by Brazil and Mexico: they account for over 60% of regional output but have grown by much less than the regional average in the period (ECLAC, 2007b).

51 The other two periods of sustained growth were 1984-1987 and 1991-1998. See ECLAC (2007b) for a comparison.

innovation and produce well-qualified human resources in key export specialization sectors and those that attract foreign direct investment.

Thus, the way a country participates in the international economy is the outcome of a particular combination of specialization patterns and the more or less active character of international trade policies in planning of this type. Where the pattern of specialization is concerned, there can be seen to be four different openings for competitiveness and learning (see chapter V). Of these, it is resource-intensive sectors that have benefited most from the external boom. However, there are ample opportunities for both product and process innovation that are only now beginning to be explored in the region (see chapters III and IV). A second area is location advantage vis-à-vis the United States market and the ability of export manufacturing firms in Mexico, Central America and the Caribbean to tap low-cost labour. Despite the proximity of the United States, there is a strong challenge from China and other Asian countries in this area of competitiveness, while a slow process of upgrading has been taking place in the respective global value chains. The third area of competitiveness is configured around medium- and high-technology manufacturing sectors that were inherited from the import substitution industrialization stage but underwent a profound transformation in the 1990s following economic liberalization. These sectors have managed to survive and, in some cases, are foraying successfully into international markets. While their weighting is modest, they do present a combination of competitiveness and capabilities that is capable of expansion. The fourth area is the development of the service sector in two particular spheres: tourism and business services. In the first of these, a number of the region’s countries have initiated major projects but the region still has huge untapped potential for diversifying and personalizing supply and thereby obtaining higher returns on its resources. Where business services are concerned, the region has shown some initial progress, but has so far been unable to capture even a proportional share of a sector that is growing vigorously around the world.

Of crucial importance in the four areas of competitiveness and learning identified are the windows of opportunity opened by the new technological paradigms, affecting all production sectors. To actually take advantage of these windows of opportunity, however, a major internal technological effort is required to gradually move the profile of the production structure towards activities that are more likely to generate and disseminate innovations. Thus, as economic development pioneers were quick to point out, technical progress and structural change have synergistic effects.

The region is better placed now than at any time in 30 years and the medium-term prospects for exploiting the opportunities thus presented look promising. It is therefore a good time to reflect on the future and consider what should be done to overcome the challenges that will arise. This assumes that external conditions will remain favourable, something that was examined in section C.

2. The options for the region’s countries

The countries of Latin America and the Caribbean have two essential tasks ahead of them: to capitalize on the opportunities and to avert the threats. Where the latter are concerned, efforts need to focus on minimizing the countries’ vulnerability to external shocks, although they can never armour themselves against every event, given their lack of economic weight when compared with the scale of the trade and financial shocks that may result from today’s upheavals. As we have said, most of the region’s countries have performed this task well, and they should persevere in the effort.

Foremost among the opportunities is the advance in productivity offered by the application and horizontal spread of new technologies; the greater export diversification which, in most cases, is beginning to be seen in products and markets; the rise in global demand for consumer goods; the internationalization prospects of some of the region’s firms; and, no less importantly, the latent promise of regional integration, which could facilitate greater levels of productive and technological integration through regional or subregional value chains.

Two basic strategies can be used, meanwhile, to take advantage of these opportunities. The first consists in using specialization to capitalize on static comparative advantages and deriving the greatest possible advantage from the countries' current position in the international economy by increasing their participation in markets where they already have a presence and, if possible, broadening the range of markets they serve. The second basic strategy is to enhance dynamic advantages through productive transformation and its aim is to create a vaster, denser and more diversified production structure so that the countries can participate in the manufacture of new products that are actually or potentially attractive because of the dynamism of demand, the scope for generating more value added or the higher productivity they induce. As will be seen later on, many of these new activities tie in with today's static comparative advantages, since there is scope to move up through the international value network associated with today's exports by improving the services and logistics associated with the production, distribution and marketing of these products. Even with natural resource exports there is scope for capturing dynamic demand niches, incorporating more value and raising productivity through investment, international alliances and progress with quality and "country branding".

In practice, for a number of reasons, these basic strategies are not mutually exclusive but complementary. The first strategy can yield critical resources (currency and financing, for example) for the second, while the second can help to modernize more traditional sectors by generating externalities through its own innovative efforts. Additionally, they also share some characteristics. First, they need to be competitive enough to completely or partially displace other producers, whether by increasing their market share or by building it up from scratch; this means remembering that other producers are participating not only in international markets but also in the home market, once this attains a certain size. Second, innovation, in a broad sense, is critical in both cases to penetrate new markets and increase participation in existing ones, mobilize untapped resources, cut costs, raise volumes, respond promptly to demand and differentiate products, among other innovations. Lastly, both strategies will require the rest of the economy to provide those public goods that are essential to companies if they are to compete but that are outside their control, since competitiveness is systemic in nature (ECLAC, 1990; see also chapter II).

In any event, the relative weight of the two strategies will depend crucially on the perceived opportunities offered by the international economy and on a number of factors in the local economy that can influence these. The first issue requires the construction of basic consensuses and will be analysed in greater detail in chapter VI. As for the second, the strategy of specialization, which is usually based on static comparative advantages or even absolute advantages, can tend to create an internal climate unfavourable to productive transformation. As already suggested in section B, market imperfections tend to affect new activities more than established ones, but other factors have an influence as well. First, in periods of rising demand and strong international prices, export revenues from traditional products will undoubtedly tend to strengthen the exchange rate, and the level of this key price will make it harder to diversify into new competitive activities. It is hard to refrain from capitalizing on this situation, notwithstanding the costs for long-term development, particularly the fact that a high proportion of the natural resources exported by the region are non-renewable; furthermore, a number of them will always be threatened by the possibility of substitution, as has happened in the past (saltpetre in Chile, tannin in Argentina and tin in Bolivia); lastly, there is no guarantee that today's high prices will stay at these levels indefinitely. In all these situations, the economy may suffer from a lock-in effect that could excessively constrain its future development options, with serious consequences for employment and social equity.

Second, existing specializations also tend to come off best in situations where the macroeconomic environment has been volatile and public policies have a history of instability, as they have learnt to cope with that environment. Third, productive transformation is faced with an unequal contest insofar as the immediate costs involved in the construction of the new comparative advantages are well understood, while the future benefits are no more than probable. Fourth, there is the economic policy aspect, with economic agents established in the specialization sectors being in a position to deploy a whole array of interests to skew public policies in their favour, whether by action (promoting public decisions that benefit them) or omission (blocking initiatives that could prove critical to productive transformation, such as the provision of public goods, for example). Public-private cooperation can be essential for overcoming such obstacles in the local context by constructing alliances to help deal with some of these dilemmas (see chapter VI).

On what basis might it be possible to construct a productive transformation strategy? As is well known, traditional international trade theory states that countries export those products which make more intensive use of their more abundant factors of production. In this context, individual products do not matter much, as they are just the mechanism whereby countries can exchange their relative endowments of the underlying factors of production. However, the ever-increasing mobility of certain factors of production, particularly capital and intermediate goods, but also labour, means that much production, particularly in manufacturing, can be located wherever it is most profitable. Thus, location will depend not just on comparative advantage but also on the general attractiveness of a particular place.[52] Accordingly, when the mobility of intermediate inputs and factors is recognized, the concept of absolute advantage plays a role much like that of comparative advantage in accounting for the siting of production (Jones, 2000).

Also gradually gaining in importance recently have been the different price components that likewise affect competitiveness, particularly those linked to know-how and technology. Their application to new products and processes has been making further inroads into the full operation of the comparative advantage doctrine. To grow and generate earnings, firms use different mechanisms to protect the competitive advantages they succeed in establishing from their competitors. Consequently, it is very difficult for new firms to compete solely on the basis of disputable cost advantages.[53]

In analysing the possible areas of competitiveness of the Latin American and Caribbean countries in the near future, a comparison with the countries of developing Asia is almost inevitable given the strong economic growth and trade performance displayed by a number of these over recent decades. In the light of what has been said, the question must be where the competitive advantages of Latin America and the Caribbean lie. The two regions differ considerably in their factor endowment. Latin America and the Caribbean have abundant natural resources and a low population density, with high rates of urbanization. Developing Asia, conversely, has fewer natural resources than it needs and a much greater density of inhabitants, with the rural population greatly predominating.

Regarding each region’s attractiveness as a place for producers to site their operations, developing Asia enjoys comparative advantages which, for a number of reasons, have gradually turned into absolute advantages. Setting out from a comparative advantage based on an almost perfectly elastic supply of low-cost labour, the region has become the manufacturing hub of the world. This initial attribute has been supplemented over time by other characteristics which have given it its “general attractiveness” as a place to site industry. Thus, the increasing division of labour in the manufacturing industry of the different countries in the region is clearly illustrated by its high indices of intraregional productive integration, as section A explained. The general business climate is stable and secure, while strong economic growth is taking place in a context of low volatility, great social discipline and political stability.

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52 When due attention is paid to the mobility of production factors, the doctrine of comparative advantage has to yield ground to that of relative attractiveness, where what counts is the overall evaluation of one country in relation to others in terms of its participation in regional and global networks, the capacities it is endowed with and its commitment to improving them, the institutional stability and security it offers, and other factors (Jones, 1980).

53 As Amsden (2001) pointed out, the prices of land, labour and capital are no longer the only factors determining competitiveness. The market mechanism is losing its status as final arbiter, and institutions that can help raise productivity are increasingly important.

Thanks to efforts begun in earlier decades, lastly, some Asian countries have made enormous cumulative progress in the area of technological capacity-building, with highly qualified human resources in science and engineering disciplines and growing involvement in global research and development processes.[54] They have generated other substantial capabilities in the areas of management, market knowledge and penetration methods, and logistical improvements to underpin their own global networks. Looking ahead, Asia also holds out the prospect of very strong consumption growth.

It is therefore hard for Latin America and the Caribbean to compete with developing Asia in those sectors or product areas that involve large volumes and low costs, where the latter region is firmly entrenched and has good prospects of displacing almost all other countries. The problem is that this applies to a considerable portion of manufacturing industry. Even in these activities, however, there are some strategic positions that ought to be exploited. This is the case with Mexico and a number of Central American and Caribbean countries, which benefit from physical proximity and preferential access to the United States market. Indeed, there are countries in the region that have now opted to enter global value chains, particularly in the electronics, automotive and apparel industries, which are basically oriented towards that market. Apart from the immediate benefits in terms of employment and, in some cases, pay, the challenge facing firms and governments now is to find ways of moving up the value chains of different products to those functions that yield the greatest value added and market power.[55] It has been shown that this is actually far from simple to achieve (Kosacoff, López and Pedrazzoli, 2007). However, some options for maximizing the advantages obtainable from these strategic positions are beginning to be discerned (see chapter V).

It needs to be realized that a presence in global value chains means meeting international quality standards, sourcing inputs at international prices and ensuring unfettered movement of goods, services and investment between the different countries involved in the value chain. It is also necessary to guarantee legal security for contracts and a favourable climate for business, innovation and entrepreneurialism. The scope for upgrading in value chains will depend on countries' progress in creating a skilled workforce and appropriate infrastructure and logistics and, increasingly, on their ability to manage a dynamic of absorption, dissemination and creation of innovation and knowledge that is manifested in a critical mass of skilled human resources connected to international innovation networks and supported by public policies that invest in these activities.

Similarly, if the region had effective, up-to-date integration mechanisms, i.e., with large unified markets, similar trade and investment rules and the possibility of accumulating rules of origin between the different intraregional trade agreements, this could facilitate both the participation of the region's firms in global chains and the development of regional or subregional value chains, thereby giving a fresh impulse to the expansion of trans-Latin enterprises.

It is important to realize, though, that the policies formerly used to promote local chains (national content requirements, for example) are no longer feasible, not just because they are forbidden by the multilateral agreements signed at the WTO, but also because they are at odds with the essential logic of global value chains (see section C). Firms seeking to participate in the global economy, in other words, have no choice but to do so by working at the local level in accordance with global rules. Some examples in the region, chiefly involving the automotive industry and some aerospace and electronics products along with business services, show that this is a feasible alternative.

Other opportunities are to be sought in the area of business services, given the workforce skills existing in a number of the region's countries. These could become service providers in global value chains, and indeed this is a goal that is being pursued in some of the countries (see

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54 See UNCTAD (2005a).

55 According to the United Nations Industrial Development Organization (UNIDO), the large improvements in the countries' industrial performance between 1985 and 1998 were due mainly to their participation in global value chains, something that led to a sharp rise in the proportion of more complex products in their exports. The largest shifts in the countries' rankings by drivers of industrial performance are closely associated with this (UNIDO, 2002).

chapter IV). Tourism services, meanwhile, have been making very considerable progress for some years, particularly in the Caribbean countries, where they account for a very substantial proportion of currency revenue. However, the whole region has an abundance of natural, cultural and historical resources that could be developed and matched to rapidly growing global demand. There are a number of innovations that could be implemented to make better use of these resources, such as differentiating supply to capture different demand niches, organizing regional sequences of activities to break long journeys, promoting near-exclusive environmental tourism packages involving flora and fauna that exist nowhere else, and arranging trips to unique historical sites and cultural events characteristic of the region.

Internationalizing production, whether regionally or globally, is another important mechanism being used by firms from different countries in the region to move up in their respective value chains and improve their market access. This is happening particularly in Brazil (oil, mining, food processing, iron and steel, aeronautics and engineering services), Mexico (telecommunications, beverages, cement and oil), Argentina (seamless steel tubing and nuclear energy), the Bolivarian Republic of Venezuela (oil and derivatives), Chile (cellulose and paper, transport services and retail distribution networks), El Salvador (air transport), Jamaica (catering) and Guatemala (poultry) (ECLAC, 2006b). Firms have been able to use these investments to increase their degree of control over different links in the value chains concerned and, as their contact with consumer markets increases, develop their ability to adapt products and processes and consolidate their own brands.[56]

In the internationalization process, companies may position themselves abroad for a variety of reasons (SOBEET, 2007). First and simplest, they may wish to support their exports, particularly of differentiated products, by investing in commercial representation, distribution, technical assistance and after-sales service activities. Second, it may be part of the strategies used by large firms in the region to position themselves in key markets so that they can take advantage of opportunities to buy assets, secure distribution channels and acquire brands abroad. Third, it is a way of solving market access problems, avoiding tariffs and taking advantage of quotas for exports to developed nations that are available in other countries.[57] Another major motivation is provided by high transport costs and the logistical difficulties involved in supplying large, far-off markets, which can lead to joint operations being set up with local firms (Da Motta Veiga and Ríos, 2008).

However, what about the many local firms that do not succeed in joining some global value chain? This is a vast and extremely heterogeneous group, with firms differing not only in size but also in their technological, managerial and organizational capabilities and the learning conditions available to them (ECLAC, 2004a). One possibility is to link up as suppliers or service providers with local firms that do succeed in joining global value chains. Another is to join forces with one another and enter the international market by their own efforts, something that would require them to aim at small segments or specialized and personalized production niches, as the previous section argued.

Lastly, many of these firms will be able to attain productivity levels high enough for the idiosyncratic advantages they derive from their knowledge of local conditions to enable them to produce goods or services for the domestic market. The expansion of small and medium-sized enterprises is essential to fill out the productive fabric and generate the jobs which participation in international markets does not produce. For this, general policies need to be implemented to facilitate their creation and development.

[56] The predicted growth in tourism from China over the coming years is an example, requiring innovations relating to its culture, language, tastes and customs (see Devlin, Estevadeordal and Rodríguez, 2006).

[57] Paradigmatic cases were the textile export quotas allocated to Nicaragua and Mauritius, which were taken advantage of by producers from Hong Kong (now SAR of China) in the 1980s.

In countries that are large recipients of family remittances, there is a need to encourage investment in projects of common interest (as in the state of Zacatecas in Mexico), microenterprises and other sustainable ventures by providing credits and supplementary technological assistance. Communities based abroad can also use their organizational potential to introduce and disseminate idiosyncratic products (such as foods and craftwork), which have met with great success in the social environment of a number of Latin American and Caribbean communities in the United States and Europe (Ocampo and Martin, 2004, chapter 7).

The exploitation and industrialization of natural resources is another area of competitiveness and learning which has a long track record in Latin America and the Caribbean, from Mexico to the Southern Cone, and where the region has comparative and, in some cases, almost absolute advantages. A number of studies produced over recent years have highlighted different opportunities associated with natural resources and development.[58] In particular, some of them have analysed cases of what are now developed countries that have maintained their specialization in natural resources and others that have diversified their production base and exports to include different types of goods and services.[59] The chief merit of these studies is that they do not automatically rule out the possibility of achieving productive development on the basis of natural resources and then diversifying, to a greater or lesser degree, into other goods and services, whether commodity-related or otherwise. They have also introduced a very important approach by stressing the question of “how” over “what” to produce.[60]

Furthermore, there are two new opportunities in relation to these sectors that the region’s countries should take advantage of. These are, first, the rise in commodity prices that has resulted from the current cycle of global development with all the structural changes it has entailed and, second, the major changes now taking place or in prospect in the development of a number of general-purpose technologies that could give rise to a wide range of product and process innovations in the food and agriculture complex, mining, services and renewable energies, among other activities.

As already noted, a number of the region’s countries, particularly those of South America, have succeeded in capitalizing on the rising demand for minerals, foods and hydrocarbons manifested in high recent (and very probably future) prices. However, the Latin American and Caribbean countries need to do much more than just reap the immediate and short-term benefits of this external windfall, which on the whole is what has been happening so far. This means using some of the revenues from their natural resources to finance innovation around this and other production complexes that have the potential to compete in international markets. Using different mechanisms, of which amendments to existing contracts are among the most common, attempts have been made in several of the region’s countries to appropriate some portion of the extra revenues generated from natural resources.[61] While understandable, this policy does create certain challenges. One is the need to avoid too much uncertainty about the ground rules; the other is the need to design policies and institutions that can promote innovation effectively.[62]

A substantial part of these resources should be channelled into creating the capabilities needed to adopt and adapt the major innovations now in the pipeline and closely track the development of general-purpose technologies in prospect for the coming years. The progress of ICTs in recent years has been spectacular and should now be followed by a stage of greater access to these and greater productive use in the developing world (see chapter IV). Biotechnology has

58 See, in particular, De Ferranti and others (2002) and the collection of articles edited by Lederman and Maloney (2006).
59 The role of natural resources in the development of Australia, Canada and the United States is reviewed in Wright and Czelusta (2006). The cases of Sweden and Finland are analysed in Blomstrom and Kokko (2006).
60 See chapter 3 of De Ferranti and others (2002), entitled “It’s Not Just What You Produce, But How: Lessons from Comparative History”.
61 Some recent notable cases in the region are those of Argentina, Bolivia, Chile, Ecuador and the Bolivarian Republic of Venezuela.
62 Chile is the one country in the region that seems to have found reasonable responses to both challenges.

also produced major advances, as have other areas such as nanotechnology, new materials and non-conventional energy sources, where major changes can be expected to come to fruition, some of them within the coming decade.[63] The scale of the benefits that firms, governments and society might obtain from them will ultimately depend on how these innovations are applied in each specific context (Pérez, 2008).

Consequently, the region's countries should concentrate on mastering general-purpose technologies and applying them to natural resource processing. In this way, each of the region's countries could capitalize on its advantages in some form of production, be this large-scale (food and drink, aluminium, cellulose and paper, copper, petrochemicals, etc.), medium-scale (special materials and personalized products) or small-scale (niche markets). This means using today's commodity exports in two ways: as a platform for productive transformation, and as source of financing for new ventures, as already mentioned.

This effort should have as its basis the capacity built up in a variety of earlier and current activities and be progressively oriented towards higher value added segments with more specialized and personalized attributes that enable firms to move up the global value chain for the product concerned. For this it will be necessary to establish innovation networks that can make the productive transformation process sustainable. Some of these innovation networks will involve firms from the same country or elsewhere that are already globalized, while others will be built around partnerships of local firms working in similar areas (wine, flowers, tourism, organic produce, etc.). These networks obviously need to forge ties with universities and with the institutions responsible for the relevant public policies, as well as with world centres of excellence in each specific area. They might also provide a basis for scientific and technological cooperation between the region's countries.

Fostering the creation of national strategies for productive transformation in each national situation involves mobilizing a wide array of dispersed social energies, and here the role of public policies is crucial, first to organize the quest for a medium- and long-term global vision for each country while catalysing the effort to identify present and future opportunities; second, to build lasting, committed and mutually beneficial alliances with the private sector whose aim is the design and application of strategies to progressively realize this vision and capitalize upon the opportunities identified; and lastly, to implement plans and programmes effectively. All these issues will be examined in chapter VI on the basis of common principles derived from successful examples of international practice.

[63] This would help not only to diversify the products derived from natural resources but also to generate the capabilities required for the production structure to evolve further.

Chapter II

Economic growth in Latin America and the Caribbean: structural change and export development

In the 1990s, Latin American and Caribbean countries implemented a set of structural reforms which helped to solve some serious and long-standing problems but did not resolve the issues of growth and equity. Moreover, in some cases, the process aggravated old structural faults and raised new difficulties, some of which were the undesired results of the reforms themselves.

The reforms were expected to result in smaller fiscal deficits, a controlled inflation rate, greater integration into world markets, a larger role for private initiative and minimal State intervention. All of this was, in turn, expected to lead to a higher and stable growth rate and, thus, lower unemployment along with real wages reflecting rising productivity. Expectations have been largely disappointed, however.

GDP has grown more slowly than in the regional expansion that occurred in earlier decades, except for the 1980s. In 1991-2003, the annual rate of GDP growth was just 2.7% (1% per capita), i.e., half of the 5.3% (2.6% per capita) recorded in 1950-1980. At the same time, Latin America and the Caribbean clearly underperformed other developing regions in the 1990s, especially South-East Asia, which grew by an average of 6% per year.

The greatest source of frustration with the performance of the Latin American and Caribbean economy has thus been the persistent divergence of per capita GDP between the region and the developed world, a trend that has existed since the 1970s but that has only started to change in the last few years (see chapter I). This gap has also been accompanied by a more unequal income distribution, compounded by increasing poverty and indigence in practically all countries of the region.

It was not until 2004 that the situation started to improve thanks to favourable international conditions and better macroeconomic management in the region, which has allowed investment levels to recover somewhat. This more positive international setting includes sustained growth of the world economy and abundant liquidity on financial markets. Two characteristics of the Latin American and Caribbean region have stood out over the last few years: a substantial improvement in the terms of trade in many countries, and the buoyancy of remittances sent back by workers who have emigrated to more developed regions of the world.

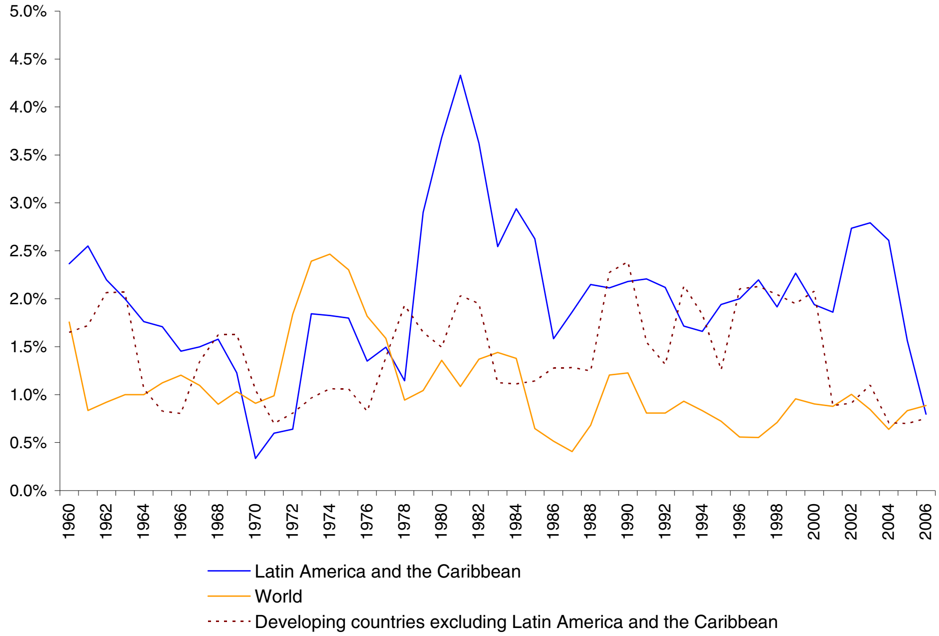
This chapter begins with an analysis of elements that help to explain the slow growth and volatility of Latin American and Caribbean economies. These factors include macroeconomic factors arising from the characteristics of the global economy and the region's position in it which helped to create a climate of instability and low growth rates. It also reviews the low investment levels and lack of financial deepening in the countries of the region, as well as the role of external constraints. Bearing in mind that macroeconomic factors are not the only cause of this situation, the chapter goes on to examine structural factors that help to account for the sluggishness of growth in recent decades. Given the importance of the region's production structure as an explanatory factor in this connection, section B looks at its specificities in the countries of the region and considers to what extent these characteristics are related to the different countries' form of integration in the world economy. As part of this discussion, the reader's attention is drawn to the decline in engineering-intensive activities in most countries of the region, as well as shortcomings in terms of human resource training and infrastructure. Section C analyses some of the characteristics of the region's export development and the channels through which exports can help to strengthen structural change and growth. Lastly, the discussion turns to technological externalities associated with greater integration into the global economy through trade and foreign direct investment.

A. Characteristics of the region's economic growth

1. Low and volatile growth rates

As mentioned in chapter I (section A), over the 25 years that preceded the upswing which began in 2003, the region generally registered low growth rates and high levels of real volatility. While per capita GDP rose by just 0.1% per annum in that period (1980-2003), the real economy was much more volatile than it was in other developing regions. Figure II.1 shows that, unlike the situation in the preceding decades, since the onset of the external debt crisis in 1982 the relative variability of growth in the region has remained considerably higher than it has been in other developing countries and in the world economy, although it has been declining in recent years.

Figure II.1
STANDARD DEVIATION OF GDP GROWTH RATES
(Five-year centred moving averages)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of figures provided by the United Nations Statistics Division and World Bank, World Development Indicators [online database].

External factors have played a key role in explaining that volatility, although the characteristics of external shocks have changed through time. Several analyses show that real turbulence predominated in the 1970s, while financial shocks were more frequent in the 1980s and 1990s and contributed more to the volatility of the level of economic activity (López Monti, 2007; Titelman, Pérez-Caldentey and Minzer, 2008).[1]

Two factors help to explain the greater incidence of financial shocks throughout most of the 1980s and the following decade. The first is the increasing size, protagonism and volatility of financial markets in that period compared to the 1970s —when the region's capital account was becoming more open; the second is the marked diversification of exports from most of the region's countries, which reduced their traditional vulnerability to changes in international prices (see section C and Machinea and Vera, 2006). Nonetheless, in the 2000s the terms of trade have once again become a major source of external disturbances for nearly all countries in the region. Raw materials prices have risen more steeply than in any other period since reliable statistics have been compiled. As a result, the earlier diversification of exports has proved insufficient to offset terms-of-trade variations. In addition, financial movements have been less virulent in the 2000s than before, thanks to abundant and continuous international liquidity and a reduction in the vulnerability of the region's countries (ECLAC, 2007b).[2]

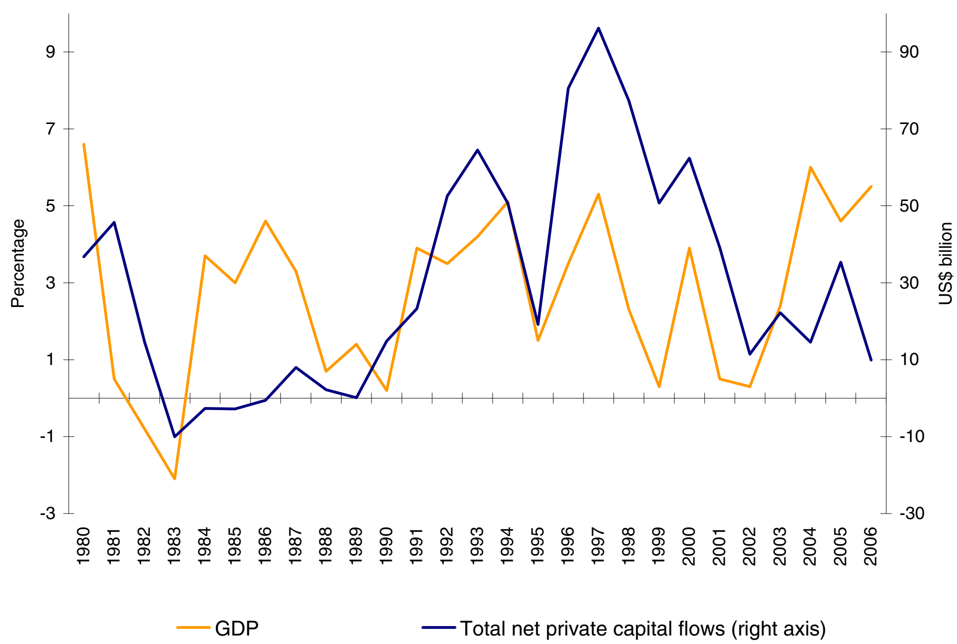
[1] Titelman, Pérez-Caldentey and Minzer (2008) show that, between 1980 and 2006, the region's countries have faced over 100 terms-of-trade shocks and 50 financial shocks. In contrast, the number of real shocks declined from 64 between 1980 and 1990 to 29 between 1991 and 2001, and to just 7 between 2002 and 2006. Thus, for the period as a whole, their frequency decreased from 6 to just 1.4 per year. Furthermore, their magnitude also declined, except for the recent terms-of-trade shocks that occurred between 2002 and 2006. In contrast, the number of financial shocks has been trending upward, although their severity decreased by over 70% between 2002 and 2006 compared to the 1990s.

[2] At least until the third quarter of 2007, when the first effects of the subprime mortgage crisis in the United States started to be felt.

External financing has also been highly procyclical and has aggravated domestic imbalances. During periods of abundant international liquidity, massive financial resources flowed into the region, fuelling unsustainable expansions in domestic spending and triggering real appreciations of local currencies. Then, when international liquidity conditions changed, not only did financing for the region dry up, but capital also started to flow out of the region, which required a deeper adjustment of domestic spending, thus exacerbating growth losses (Ocampo, 2001; Ffrench-Davis, 2006b).

Often, these changes bore no direct relation to factors originating in the region's countries, but instead reflected contagion phenomena stemming from trading relations or financial interdependence between the countries of different regions, which have intensified in the current phase of globalization.[3] Figure II.2 shows the close relationship that exists between the availability of external financial resources and GDP growth and its clearly procyclical behaviour.

Figure II.2
LATIN AMERICA AND THE CARIBBEAN (32 COUNTRIES): TOTAL NET PRIVATE CAPITAL FLOW AND ANNUAL GDP GROWTH



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of figures from International Monetary Fund (IMF), *World Economic Outlook*, 2007, Washington, D.C., October 2007.

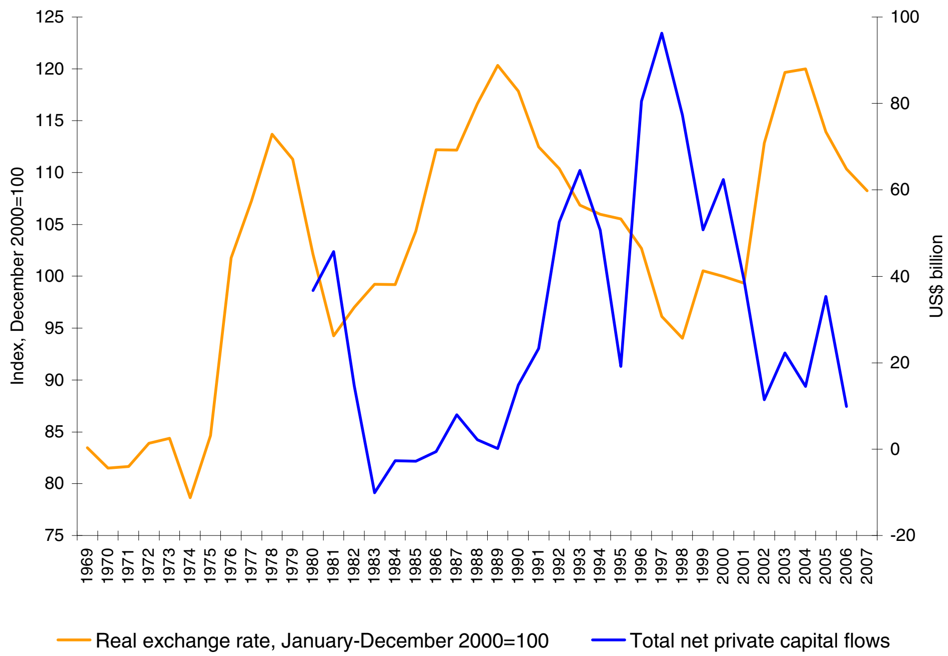
Apart from the volatility of capital movements, the way the region participates in the international economy continues to play a key role in its own economic performance. In many cases, positive and negative terms-of-trade shocks are amplified through financial markets, thereby making the level of economic activity even more volatile.

The real exchange rate has also suffered from the region's volatility (ECLAC, 2006b), and this has reduced incentives for production of tradable goods, exports and their diversification. Episodes of real overvaluation have been frequent in Latin America and the Caribbean and have

[3] Contagion also stems from the way foreign financiers manage their investment portfolios. As a result of the practice of considering a group of countries with similar characteristics as a single asset class for investment purposes, the region can be affected by events occurring in other countries in the same category with which it has no significant direct relationship. This is also intensified by the demonstration effect and competition between financial agents targeting short-run returns, which triggers herd behaviour that amplifies the fluctuations in external liquidity.

sometimes been quite intense.[4] The various reasons for this include strong capital inflows and counterinflationary policies that use the nominal exchange rate as an anchor. These factors have caused significant real exchange-rate misalignments, sometimes followed by large-scale devaluations. Figure II.3 shows the variability of the real exchange rate and its inverse relationship with net private capital flows.

Figure II.3
LATIN AMERICA: REAL EFFECTIVE EXCHANGE RATE AND TOTAL NET PRIVATE CAPITAL FLOWS [a]



Source: Economic Commission for Latin America and the Caribbean (ECLAC) and International Monetary Fund (IMF), *World Economic Outlook,* 2007, Washington, D.C., October 2007.

[a] The figures for 2007 are preliminary.

In this context, perhaps one of the region's greatest weaknesses in the macroeconomic sphere has been its inability –as a result of decisions either taken by the countries' authorities themselves or, in some cases, prompted by international credit institutions– to apply countercyclical policies. In particular, recent macroeconomic trends point to the need to contain the volatility of the real exchange rate and excessive private borrowing in the expansionary phases of the cycle. In terms of fiscal policies, the increased prudence displayed in this area in recent years has been based almost exclusively on the existence of a certain consensus in this regard, although this has not resulted in the establishment of fiscal institutions that are sufficiently consolidated to ensure their sustainability over time (Machinea, 2007).

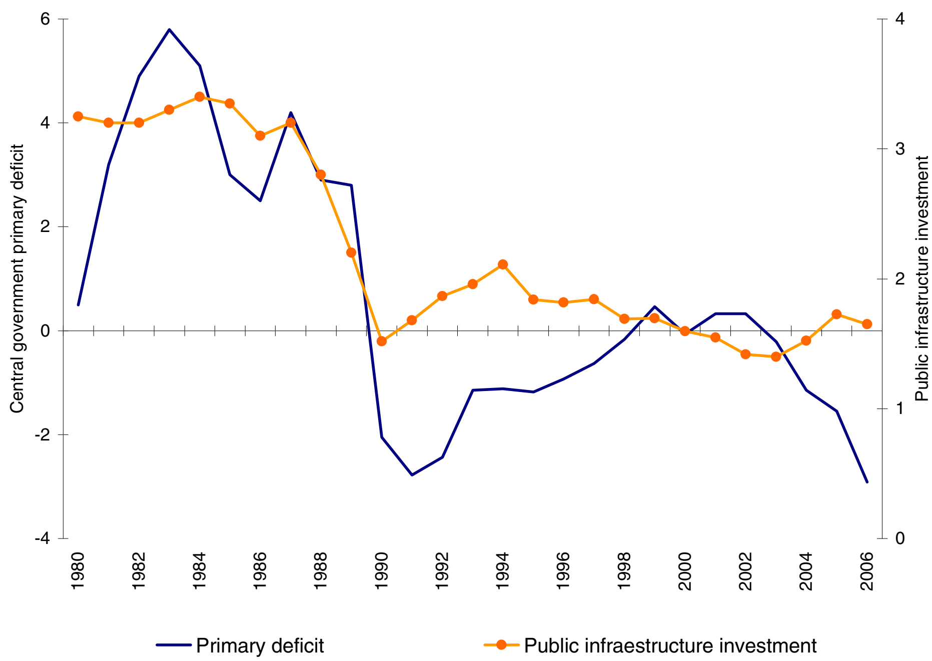
2. A lacklustre performance in terms of investment and the financial system

While the low rate of GDP growth and its high volatility have had an adverse effect on private investment, the procyclical nature of tax revenues has made public investment even more variable, as it has often been reduced when such resources are in shorter supply in an effort to keep

[4] Taylor (1998) estimates the effects of currency overvaluation in the region, along with other distortions. Sachs (1985), Fischer (1993) and Rodrik (2007) make empirical studies of the positive growth effect of a high real exchange rate.

the public deficit within manageable bounds. Figure II.4 shows the relationship between the primary deficit and public infrastructure investment in seven of the region's economies, including the largest ones.[5] The figure shows that, since the 1982 debt crisis, deficit reduction has largely been achieved at the expense of less public investment in infrastructure. Although the primary surpluses generated in the first half of the 1990s allowed public investment to recover to some extent, it remains low. This situation reflects the widespread belief that the private sector should take the place of the public sector in infrastructure investment, as evidenced by the introduction of new ways of financing infrastructure works, such as concessions. Private investment, however, has not been sufficient to make up for shortfalls in public investment.

Figure II.4
LATIN AMERICA (7 COUNTRIES): PRIMARY DEFICIT AND PUBLIC INFRASTRUCTURE INVESTMENT
(Percentages of GDP)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of in-house information and data supplied by Luis Servén and César Calderón, "Trends in infrastructure in Latin America, 1980-2001", *Documentos de trabajo series*, No. 269, Santiago, Chile, Central Bank of Chile, September 2004.

In the period 1991-2003, the investment rate rose slightly until 1997, before dropping back to below its level at the start of the decade. From 1981 onward, this coefficient had fallen steeply from the levels prevailing in the second half of the 1970s (around 25% of GDP). Supported by external borrowing, gross fixed capital formation rose at a steady rate in the 1970s, before being brought to an abrupt halt by the outbreak of the external debt crisis in 1982, after which it declined for roughly 10 years (see figure II.5). In the 1990s, this variable recovered somewhat against the backdrop of better external liquidity conditions, but the improvement was undermined by the effect of the external shocks that occurred in that period (such as the "Asian crisis" in 1998), which prevented it from regaining pre-1982 levels.

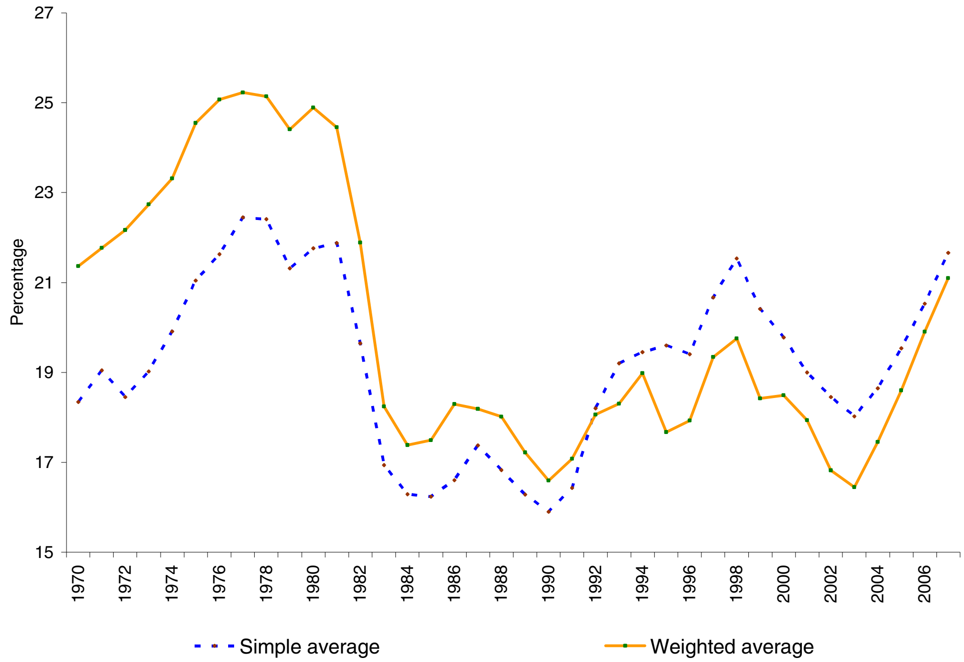
[5] The countries shown are Argentina, Bolivia, Brazil, Chile, Colombia, Mexico and Peru.

However, this situation has changed drastically since 2004, when investment became the fastest-growing factor of demand in most of the economies of the region, rising in 2007 to a 27-year high. Moreover, this growth was stimulated primarily by investment in durable production goods.[6] Nevertheless, investment still appears to be insufficient to sustain annual growth rates of more than 5%. A greater effort is therefore needed in this respect, and, clearly, that effort must not be based solely on expectations for growth and profitability, but must also rely on the stability of the rules of the game.

Figure II.5

LATIN AMERICA AND THE CARIBBEAN (19 COUNTRIES): GROSS FIXED CAPITAL FORMATION AS A PERCENTAGE OF GDP, 1970-2007 [a]

(Based on figures in dollars at 2000 prices)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of official figures.

[a] The figures for 2007 are preliminary.

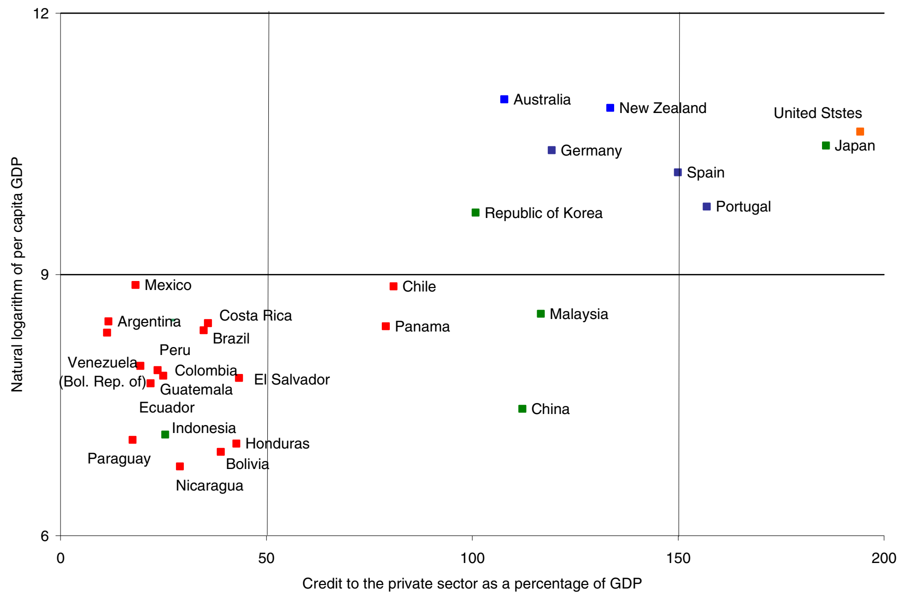
During the reform period, the link between investment and growth deteriorated, as the incremental investment-to-GDP ratio rose from a simple average of 3.8 in 1950-1980 to 6.7 in 1990-2002. This feature, which has not been analysed in sufficient depth, may reflect the fact that volatility in economic growth leads to a high level of idle capacity, thereby reducing capital efficiency. In some cases, it may be the result of capital destruction deriving from the economic reform process.

The behaviour of the national financial system also contributed to the high level of instability. In particular, financial system liberalization, without an adequate institutional framework for regulation and supervision in place, resulted in major credit expansions and excessive risk-taking by banks during upswings in the business cycle. As a result, financial crises were more frequent in the region than in other parts of the world at similar development levels.[7] The outcome was a greater development of financial intermediation in various countries of the region, which translated into a weaker capacity to capture saving and channel it into financing for investment and for supporting growth (see figure II.6).

[6] See Machinea and Kacef (2007) and ECLAC (2007b).

[7] Overcoming those crises introduced an additional factor of instability, either because the monetization of bank losses fuelled inflation, or because the increase in debt to sterilize the monetary expansion placed an additional burden on public expenditure.

Figure II.6
FINANCIAL DEEPENING AND PER CAPITA GDP, 2005

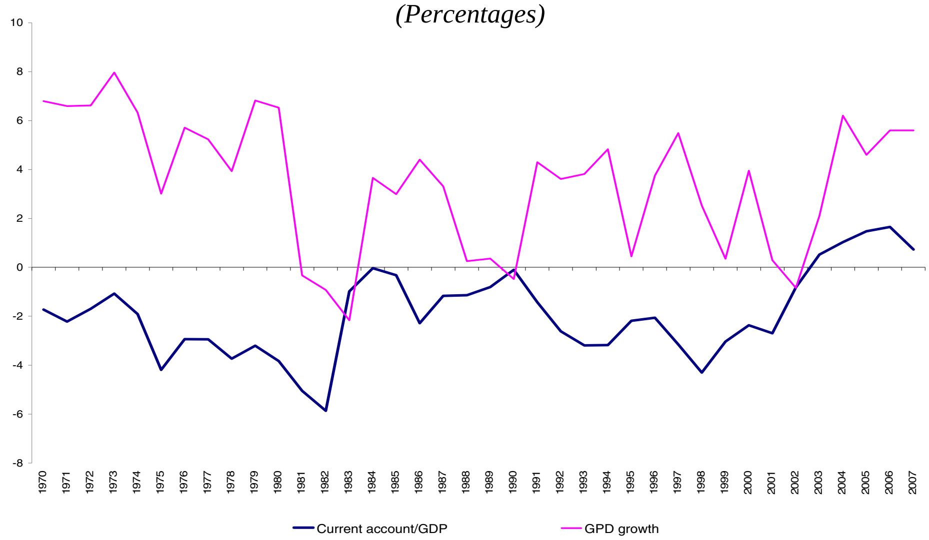


Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of International Monetary Fund (IMF), *International Financial Statistics*, Washington, D.C.

3. The burden of external constraints

In conjunction with this instability in the region, external constraints have been one of the factors having the strongest negative impact on sustained growth in the region. Figure II.7 shows the inverse relationship between the balance-of-payments current account and GDP growth, which has caused external constraints to act as a restriction on growth. As this figure shows, positive GDP growth rates have been associated with widening current account deficits. External constraints have been overcome in the short term by excessive foreign borrowing, which has left the region's economies in a more vulnerable position as a result of the volatility of capital flows.

Figure II.7
LATIN AMERICA (19 COUNTRIES): THE CURRENT ACCOUNT AS A PERCENTAGE OF GDP AND GDP GROWTH
(Percentages)



Source: Economic Commission for Latin America and the Caribbean (ECLAC).

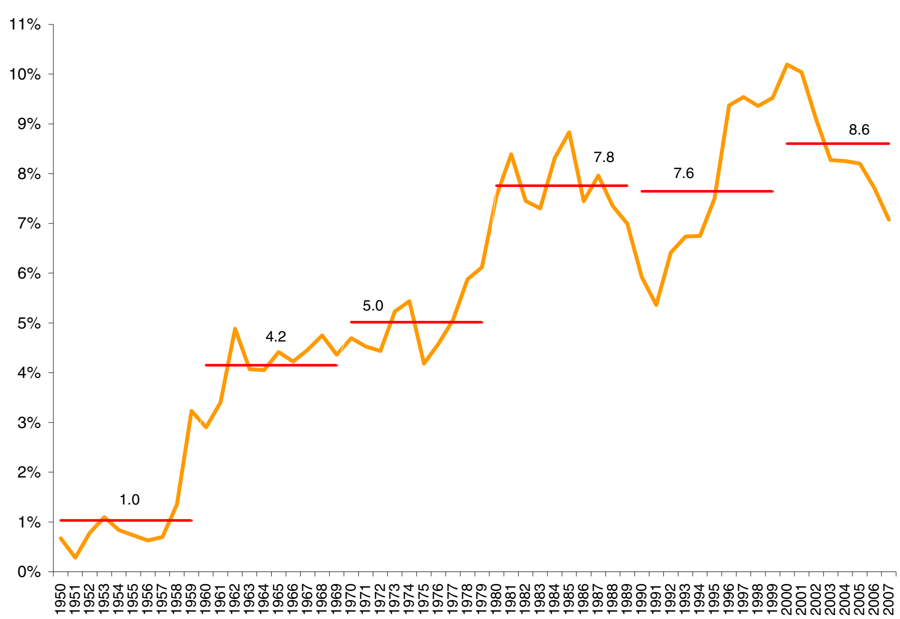
This figure clearly illustrates the consequences for growth of episodes in which external borrowing has triggered serious balance-of-payments crises and a resulting adjustment in the level of domestic activity. Examples include the external debt crisis of the early 1980s and the 1997 Asian crisis.

Since mid-2003, the terms-of-trade improvement has helped countries to maintain large trade surpluses, despite larger import volumes. Does this mean that the recurrent balance-of-payment crises suffered in the region are a thing of the past?

In response, it may be stated, first of all, that as a result of the economic liberalization policies in recent years, the region's economies are now more open than in the early 1980s. Trade has been liberalized a great deal, with the regional trade openness coefficient tripling from 7.8% in 1980-1983 to 24.5% in 2005-2007.

As regards the region's stronger external trade performance, its economic history shows that export growth in volume terms increased sharply over the past 50 years, (see figure II.8). Between 1991 and 2000, the volume of exports from the region grew at an annual rate of 9.2% (9.7% excluding the Bolivarian Republic of Venezuela), outstripping the world average. There has, however, been a clear downward trend in this series over the last few years, which is not unrelated to the growing difficulties faced by exporters in Mexico and several Central American countries in competing with Chinese products on the United States market.

Figure II.8
LATIN AMERICA (18 COUNTRIES): 10-YEAR GROWTH RATE IN THE VOLUME OF EXPORTS [a]
(Percentages)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of official figures.

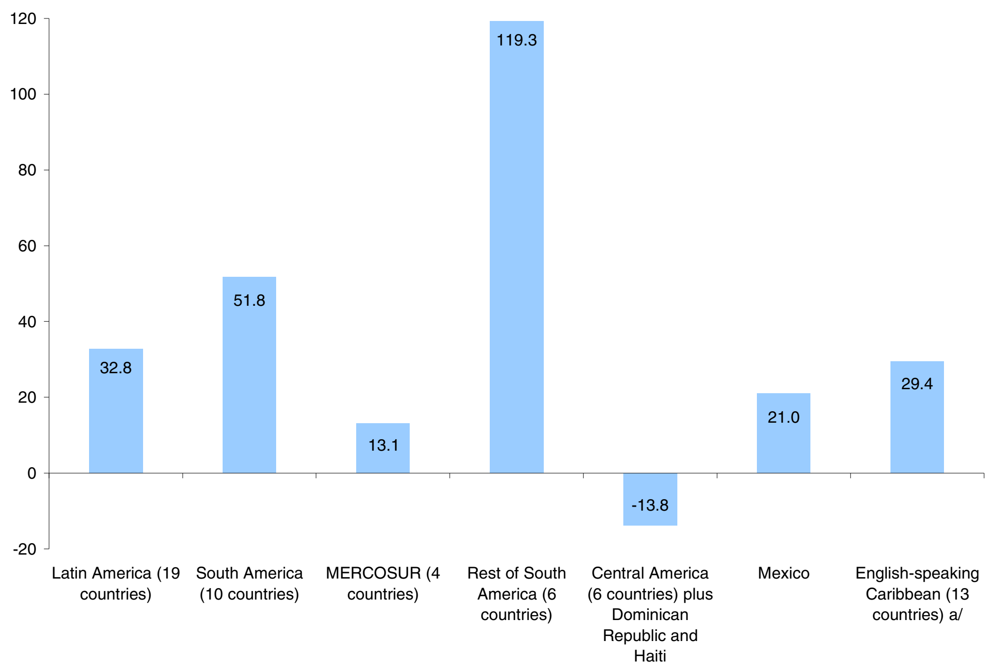
[a] The Bolivarian Republic of Venezuela is not included because the nature of its exports makes its behaviour very different from that of the region's other countries. When the Bolivarian Republic of Venezuela is included, the corresponding export volume growth rates are: 4.6%, 4.9%, 1.5%, 4.7%, 7.3% and 8.0%.

Exports from South America are following a slow upward trend, and the recent deterioration has not been so accentuated. In many South American countries, export growth is not confined to raw materials but increasingly includes manufactures or non-traditional products, whose growth rates have increased in recent years (see chapter V, section A). Moreover, this increase in manufactured exports is not confined to intraregional trade, but extends to other markets of the developed and developing world.

Stronger growth in export volumes notwithstanding, exports have not kept pace with the increase in imports. In recent decades, however, thanks to improved terms of trade, which have helped to maintain substantial trade surpluses, growth in the region's economies has not given rise to a general pattern of current account deficits. Based on these surpluses and the inflow of resources in the form of transfers from emigrants, the economies of the region have been able to grow without relying on external funding.

The question of whether the new export buoyancy will be sufficient to cancel out the negative impact on growth of external constraints (usual in economic growth periods) calls to mind two factors that will determine the response. The first relates to the possible trend of the terms of trade and the second to import growth.

Figure II.9
PERCENTAGE CHANGE IN THE TERMS OF TRADE
(2007 percentage compared to the average for the 1990s)



Source: Economic Commission for Latin America and the Caribbean (ECLAC).

[a] 2005 percentage compared to the average for the 1990s.

With regard to the terms of trade, the growing share of the large Asian economies in international trade has tended to boost global demand for commodities and natural-resource-based products; but, at the same time, it has also elicited a substantial increase in the supply of manufactured goods. Consequently, the relative price of commodities has tended to rise over the last few years while the prices of certain manufactures have tended to fall, although this dynamic does not affect all of the region's countries in the same way. For those countries as a whole, the terms of trade improved by 32.8% when the 2007 figures are compared with the average for the

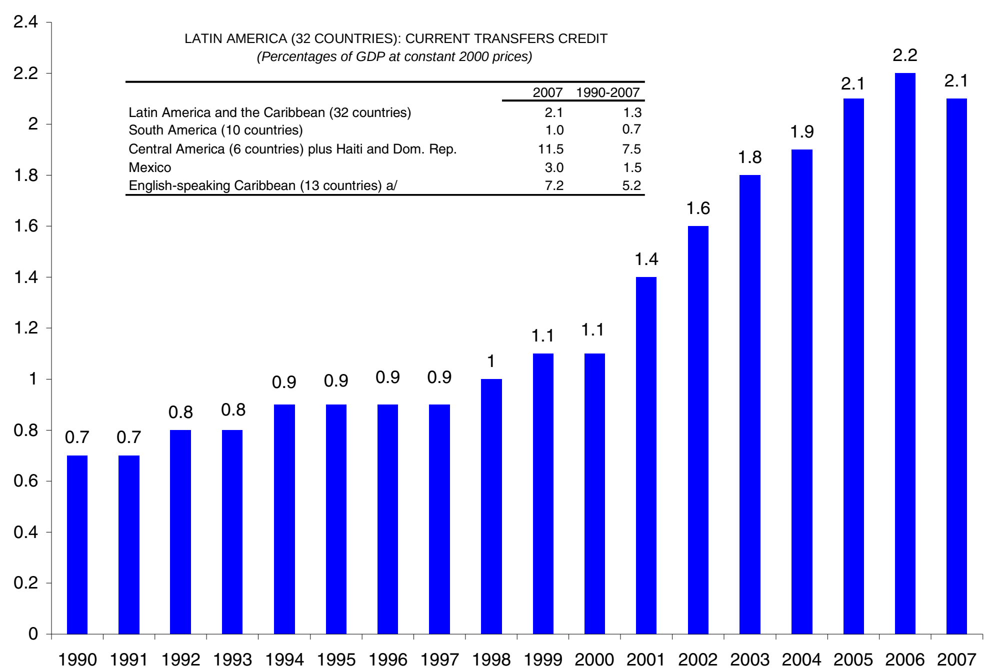
1990s; the ratio for South American countries improved by 51.8%, and for Mexico by 21%; in contrast, the terms of trade for Central American countries fell by 13.8%.[8]

The terms of trade for English-speaking Caribbean countries improved by an average of 29%, thanks largely to the improvement experienced by Trinidad and Tobago. If that country is excluded, the overall improvement is 4.9%.

Although the terms of trade have trended downward in Central American countries, many of them, together with the Caribbean countries and Mexico, receive large quantities of remittances sent by migrant workers. In 2007, such funds accounted for 2.1% of GDP for the region as a whole, but in Central America they were equivalent to 11.5% of GDP, and in Mexico, to 3%; i.e. more than what the latter receives in foreign investment. In the Caribbean countries, remittances amounted to 7.2% of GDP in 2006.[9] Since 2007 there has been a slight reduction in the volume of remittances as a percentage of GDP, which reflects the slackening of the construction market in the United States and its effects on the demand for less skilled labour, thus demonstrating the region's continued exposure to the vagaries of developed economies.

Although it is hard to make a forecast, it is not unrealistic to expect the terms of trade to stay high for Latin America and the Caribbean as a whole, albeit with ebbs and flows, compared to the levels seen over the last 40 years. Nonetheless it is also likely that its growth rate will tend to slow, or even that the prices of primary goods will diminish slightly, as international markets adapt to the new reality. It is also feasible to expect worker remittances to level off (or even decline), both because of more stringent migration policies and for demographic reasons.

Figure II.10
LATIN AMERICA (19 COUNTRIES): CURRENT TRANSFERS (CREDIT)
(Percentages of GDP at constant 2000 prices)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of official figures.

[a] The figures correspond to 2006.

[8] The exception in South America has been Uruguay, where the terms of trade fell by 21% during the period analysed.

[9] In Figure II.10, balance of payments credits in respect of current transfers are used as the closest approximation to remittances.

The region's countries also display a high income-elasticity of imports, which, for the reasons mentioned above, casts doubt on the chances of export growth being sufficient to avert an over-reliance on external saving in the upswing phase.[10] Over the last few years, the gross income-elasticity of imports has been around 2.5, whereas a number of econometric estimations that take account of other factors, including the real exchange rate, suggest values for that parameter of 0.7 in Peru, 1.1 in Chile, 1.5 in Colombia, 2.0 in Argentina, 2.3 in Mexico and 2.5 in Uruguay, as averages for the period 1960-2006 (Bello and Pineda, 2007). These estimates also show the income-elasticity of imports trending upward in nearly all of the region's countries over the last 15 years. Thus, unless export growth accelerates, the high elasticity of imports could put growing pressure on the current account and, therefore, on external financing requirements —assuming that export prices stop rising.

Estimates of the price elasticities of imports in the region are low, generally below -0.5 in absolute value terms. Accordingly, if a negative external shock affects the terms of trade, even partly counteracting its effects on the balance of payments will require a combination of cuts in activity levels and significant real devaluations, particularly if export supply fails to respond in the short term to the incentives of a higher exchange rate or is directed towards slower-growing markets.[11]

In sum, macroeconomic aspects have improved significantly since 2004 in most of the region's countries, along with employment and job quality and external solvency indicators. This situation has been supported by a positive external setting, which is reflected not only as a terms-of-trade improvement but also in greater international liquidity and high levels of remittances from emigrants living in other parts of the world. Unfortunately, turbulence on international markets suggests that this economic climate may not last much longer. Nonetheless, the structural factors underlying the terms-of-trade improvement and the high level of remittances will probably continue to operate in the immediate future, which suggests a favourable situation for meeting the challenges posed by further changes in production patterns and export development aimed at raising potential growth. These topics will be discussed in the following sections.

B. Production structure, productivity and growth

In the early phases of industrialization, the rising demand for manufactured products —both as inputs for primary sectors and in response to the increase in consumption by workers— formed a favourable setting for an larger increase in the manufacturing sector's share of total GDP, as well as raising growth rates. Moreover, the increasing complexity of societies and their economies required the development of private and public institutions to facilitate economic activities, the supply of public goods (including governance, defence, security and environmental protection) and the establishment of social protection systems. Subsequently, as technological progress reached higher stages, aspects relating to knowledge generation and its application to the production sphere became more important. These two factors, the changing nature of technological progress and institutional development needs, led to a steady increase in the importance of the tertiary sectors producing services and intangible goods (health, knowledge, finance and logistics, among others).

The construction of infrastructure and investment in new machinery and equipment in the early phases of industrialization resulted in a high rate of factor accumulation and large movements of the labour force from the countryside to the cities. During that phase, factor accumulation attained its greatest influence on growth, as has recently been seen in the late-industrializing countries of East Asia. Through massive accumulation of physical capital, among other things, these countries adopted and adapted the technological progress embedded in machinery and equipment, enabling them to attain high growth rates and close the gap on advanced countries.

[10] See Senhadji (1998) and Bello and Pineda (2007), among others.

[11] The impact would be less in several of the region's countries that still have current account surpluses.

Nonetheless, having attained high levels of technological progress, maintaining high growth rates has called for greater contributions to growth from intangible forms of capital (institutional and human) and from total factor productivity (TFP).

Several descriptions of the evolution of the East Asian economies highlight the greater importance of factor productivity in their growth from the mid-1980s until today (e.g., Kim, 2002; Lau and Park, 2003). The increasing effect of productivity on growth is likely to have been fuelled by the significant increase in research and development investment over the last 20 years.

While there is no fixed sequence for the successive growth phases, the evidence suggests that, once certain initial stages have been overcome, in which the infrastructure needed for higher development levels is built (a process in which factor accumulation usually plays a key role), technical progress, as reflected in continuous productivity gains, becomes a progressively more important growth factor.

This dynamic is illustrated in the next figure, which shows the trend of those components over time in a selected group of countries, ranked in ascending order of per capita GDP.

In China, over 80% of growth until the mid-1990s is explained by physical capital accumulation, with TFP making no contribution at all throughout the period studied. In the Republic of Korea, which has a higher per capita GDP, the contribution of physical capital to growth is initially also close to 80%; but TFP growth becomes increasingly important as from the mid-1980s. This shows how the key role of physical capital accumulation diminishes as higher stages of growth are attained. In Japan, which is at a higher level in terms of per capita GDP, one can detect a transition from growth based on capital accumulation to growth in which the dominant factor is productivity. Lastly, the developed countries in the Group of Five (G5) (excluding Japan) have displayed a growth pattern for several decades in which the TFP increase is the driving force.

Figure II.11 also reflects one of the major difficulties facing the analysis of growth factors, namely correct measurement of human capital and how it interacts with other factors.[12]

To represent human capital and estimate its contribution to growth, Lau and Park (2003) used the total number of years of schooling (primary, secondary and tertiary) among the working-age population. In the econometric analyses performed by those authors, although the growth contribution of this variable is positive and statistically significant, its magnitude is very small —possibly due to its slow pace of change, or else an inadequate representation of the quality of human capital.[13] Other studies attempt to capture the effects of improvements in the quality of human capital and report higher levels for the growth contribution of this factor, although generally they are smaller than the contributions made by physical capital and labour.[14] Several other authors claim the existence of a non-linear relation between human capital and growth. According to this, only after achieving a certain development level would conditions be attained for effective absorption of incorporated technical progress, its adaptation and the original creation of innovations that would make it possible to close productivity gaps with respect to developed economies (*catch-up*)[15].Given the difficulties of measuring the quality of human capital and representing the changing interaction between this variable and other growth factors, its impact tends to suggest a larger effect for TFP, which is the residual element in growth accounting.

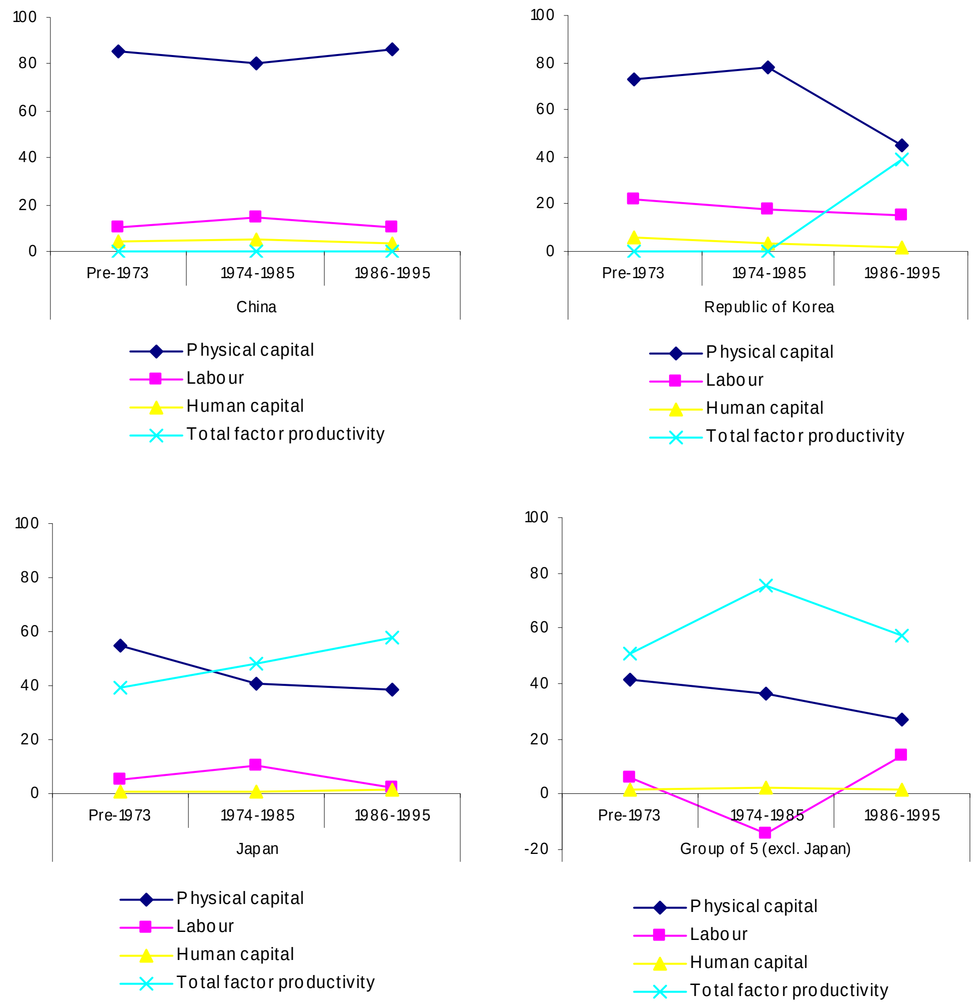
[12] See Abramovitz (1993); Temple (1999); Lau and Park (2003); Barro (1991), Barro and Lee (2001) and, more recently, Stevens and Weale (2003) and CAF (2006).

[13] Easterly and Levine (2002), among others, obtain similar results.

[14] See Collins and Bosworth (1996), among others. Barro and Lee (2001) study the effects of education quality on growth for the period 1965-1995 in nearly 100 countries, and find a particularly close positive relation with the results obtained in science examinations.

[15] See Collins and Bosworth (1996) and Kim (2002) among others.

Figure II.11
CONTRIBUTION OF GROWTH FACTORS (SELECTED COUNTRIES)
(Percentages)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of L. Lau and J. Park, “The Sources of East Asian Economic Growth Revisited”, Stanford University, 2003.

Unlike the cases analysed, Latin America and the Caribbean have a weak accumulation of physical capital and very low total factor productivity (TFP). This sluggishness was exacerbated in the 1980s. Table II.1 shows that, in six of the region’s countries, including the largest economies, the annual rate of TFP growth trended downward in the 1970s and was negative during the external debt crisis and the “Asian crisis”. On average, throughout the period analysed, the region’s TFP growth remained at very low levels.[16]

[16] The figures shown in this table are an estimation of TFP growth using the growth accounting methodology, which takes account of the growth effects of factor accumulation (capital and labour), labour quality (skilled and unskilled) and degree of capital use (see ECLAC, 2006b).

Table II.1
ANNUAL GROWTH RATE OF TOTAL FACTOR PRODUCTIVITY
(Percentages)

	1961-1965	1966-1970	1971-1975	1976-1980	1981-1985	1986-1990	1991-1995	1996-2002	1961-2002
Argentina	0.7	1.6	0.4	-1.0	-2.2	-0.1	5.1	-1.2	0.4
Brazil	1.6	4.5	4.6	0.3	-1.9	-1.4	0.2	-0.5	0.9
Chile	1.7	2.0	-2.9	3.6	0.0	2.6	4.2	-0.3	1.4
Colombia	1.2	2.4	1.8	1.3	-0.7	1.1	0.8	-1.0	0.9
Mexico	2.0	0.9	0.6	1.3	-2.5	-1.1	-0.9	-0.7	0.0
Venezuela (Bol. Rep. of)	1.4	-0.9	-2.1	-4.4	-2.7	0.8	0.6	-1.6	-1.1
Simple average	1.4	1.7	0.4	0.2	-1.7	0.3	1.7	-0.9	0.4
Average not including Venezuela (Bol. Rep. of)	1.4	2.3	0.9	1.1	-1.5	0.2	1.9	-0.7	0.7

Source: Economic Commission for Latin America and the Caribbean (ECLAC), *Economic Survey of Latin America and the Caribbean, 2006-2007* (LC/G.2338-P/E), Santiago, Chile, July 2007. United Nations publication, Sales No. E.07.II.G.2.

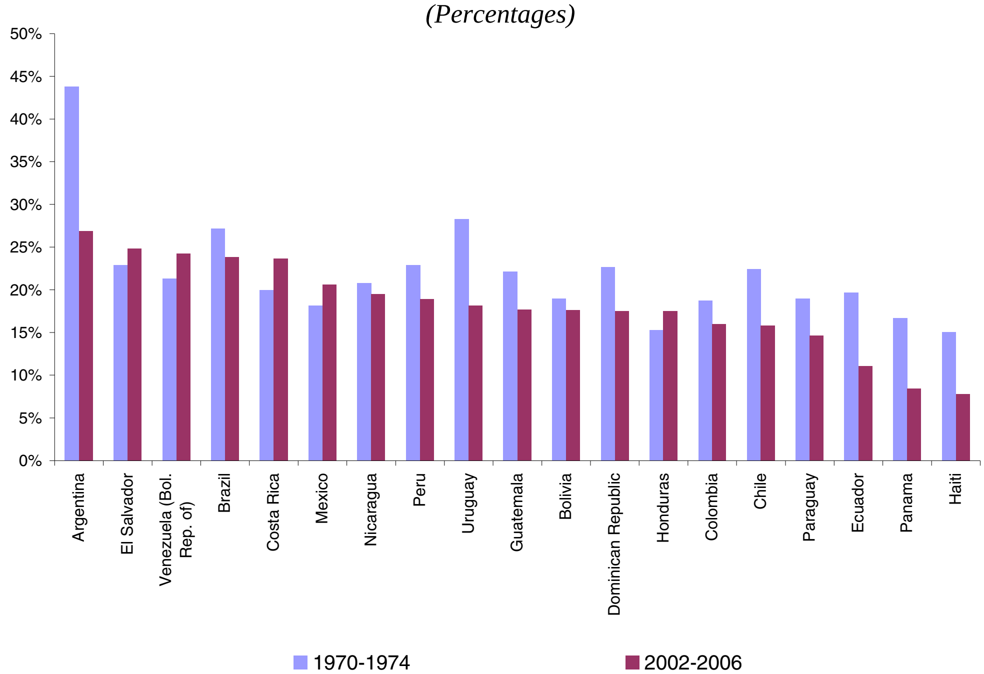
Lastly, as analysed in chapter I, productivity is very closely related to sector-level characteristics, capacities and policies (the channelling of resources towards more productive sectors; creation, adoption and dissemination of technical progress; innovation among processes, products and commercial strategies, among others), for which reason it is impossible to adequately account for the region's economic growth without referring to the evolution of the production structure and its possible effects on economic growth.

1. Evolution of the production structure and productivity

The region has shown changes in its production structure which, to some extent, are similar to those described above, but with large variations that may affect its long-term growth capacity. The feature that contrasts most with the trend in countries that have achieved high growth rates is the apparently premature reduction —at least in relation to per capita GDP— in the manufacturing sector's share of total value added. This is discernible in the vast majority of the region's countries, but is particularly accentuated in the Southern Cone, and, to some extent, Brazil (Ocampo and Martin, 2003a). Figure II.12 compares the average share of the manufacturing sector in total value-added for the periods 1970-1974 and 2002-2006.

This phenomenon could have a variety of causes. Firstly, sudden trade liberalization, often accompanied by large exchange-rate appreciations, such as occurred in Latin America, particularly in the Southern Cone in the late 1970s and since the debt crisis especially, triggered a steep fall in the relative importance of manufacturing sectors. Against that backdrop, a pattern of productive specialization developed, particularly in South America, which was clearly dominated by activities based on natural-resource exploitation. A second deindustrialization factor stemmed from the global reallocation of labour-intensive activities (*offshoring*), which is likely to have caused slower growth in the region's manufacturing sector, and also in industrialised countries. This has been reflected in less active incorporation into global value chains by the region's countries, except for a number of Central American and Caribbean countries and Mexico. Thirdly, the reduction of the manufacturing share could partly be the result of the spread of outsourcing practices, which means that several activities that were previously included in manufacturing firms' processes are now being undertaken by third parties. This is highly relevant in the case of logistics activities (transport, storage and communication) and others not directly linked to production (cleaning, security, accounting and financial management, marketing), which today are done by specialist firms, thus raising the share of services in total value-added (Ocampo and Martin, 2003a; ECLAC, 2004a and Palma, 2005).

Figure II.12
LATIN AMERICA AND THE CARIBBEAN: MANUFACTURING SECTOR SHARE OF TOTAL VALUE ADDED [a]
(Percentages)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of United Nations, Statistics Division, National Accounts Main Aggregates Database [online database].

[a] Figures in dollars at 1990 prices.

The deindustrialization process in the region has probably occurred before the manufacturing sector has exhausted its potential for raising productivity levels through economies of scale and dynamic advantages.[17] Thus, the smaller relative share of industry and, in certain cases, its absolute decline also, caused a loss of potential growth. The weaker absorption of employment in that sector, resulting from the sharp reduction in its activity, helped to increase employment in the services sectors, in many cases involving low-productivity jobs (ECLAC, 2007e).

This change in production structure has given rise to a new type of dualism, not only between the traditional rural sector and the modern urban sector (Lewis, 1954), but also in terms of the clear productivity differences between urban sectors and within certain sectors (e.g. commerce and manufacturing), in which productive heterogeneity has become more acute (ECLAC, 2007e).[18]

This reduction in the relative size of manufacturing has also been accompanied by a quality change, with less orientation towards knowledge-intensive activities. Given the characteristics of technological progress, this could undermine future growth capacity.

Figure II.13 compares the share of engineering-intensive industries in the manufacturing output of selected countries with the world average in two periods. Amounts below 1 indicate a share that is below the world average, whereas points above the diagonal line indicate a loss of share between the two periods. The share of engineering-intensive sectors in the region's countries is below the world average (its relative values are less than one); it also declined in the period 1970-

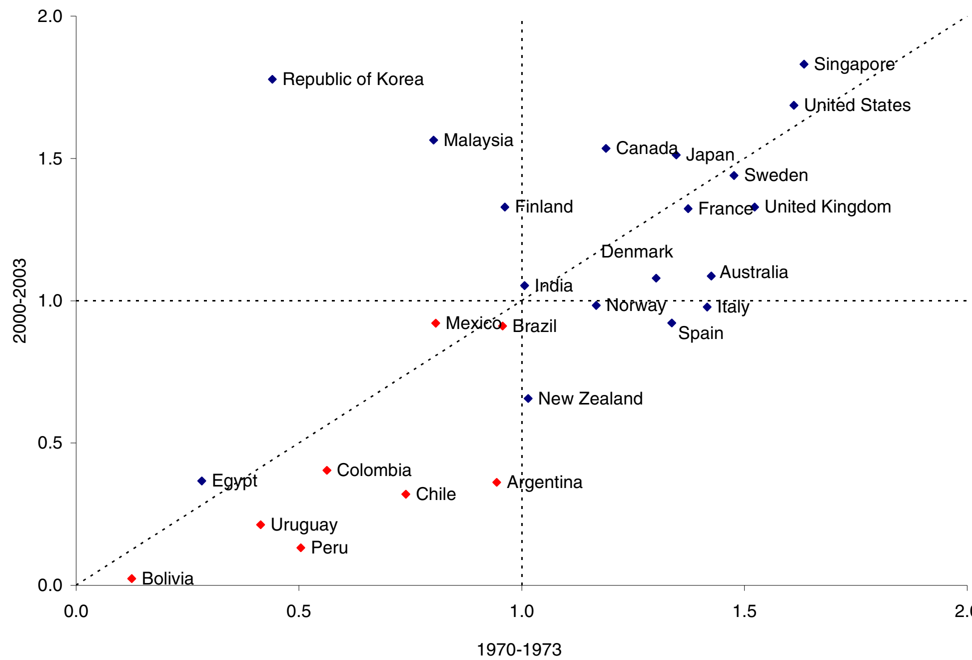
[17] See Fajnzylber (1983) and Torres (2006) on the truncated industrialization process in Latin America. Palma (2005) provides evidence showing that, apart from the structural factors that reduced the industry share of GDP and employment, as an inherent feature of the development process, significant changes in development strategies in the cases of Argentina, Brazil, Chile and Uruguay led to even more intensive deindustrialization from the 1980s onwards.

[18] As a result of these structural trends, employment in the low-productivity services sector plays a clear countercyclical role, expanding in recessions and contracting during recovery periods (Machinea, Kacef and Weller, 2007).

1973 and at the start of this decade, except in Mexico. This reduction was particularly pronounced in the Southern Cone.[19]

Figure II.13

SHARE OF ENGINEERING-INTENSIVE INDUSTRIES IN MANUFACTURING OUTPUT, COMPARED TO THE WORLD AVERAGE



Source: United Nations Industrial Development Organization (UNIDO) and Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of the Industrial Performance Analysis Program (PADI).

It might be claimed that the change in the share of engineering-intensive sectors is the natural outcome of greater specialization in primary goods producing sectors by several of the region's countries. Nonetheless, as figure II.13 shows, the importance of the engineering-intensive sectors in countries that are also significantly biased towards natural-resource-based activities, such as Australia, Canada, Norway and New Zealand, has generally been, and still is, substantially greater than in Latin America and the Caribbean. This is true even when the comparison is made between economies that are relatively similar in size and other characteristics, e.g., New Zealand with Chile or Uruguay, or Australia with Argentina.

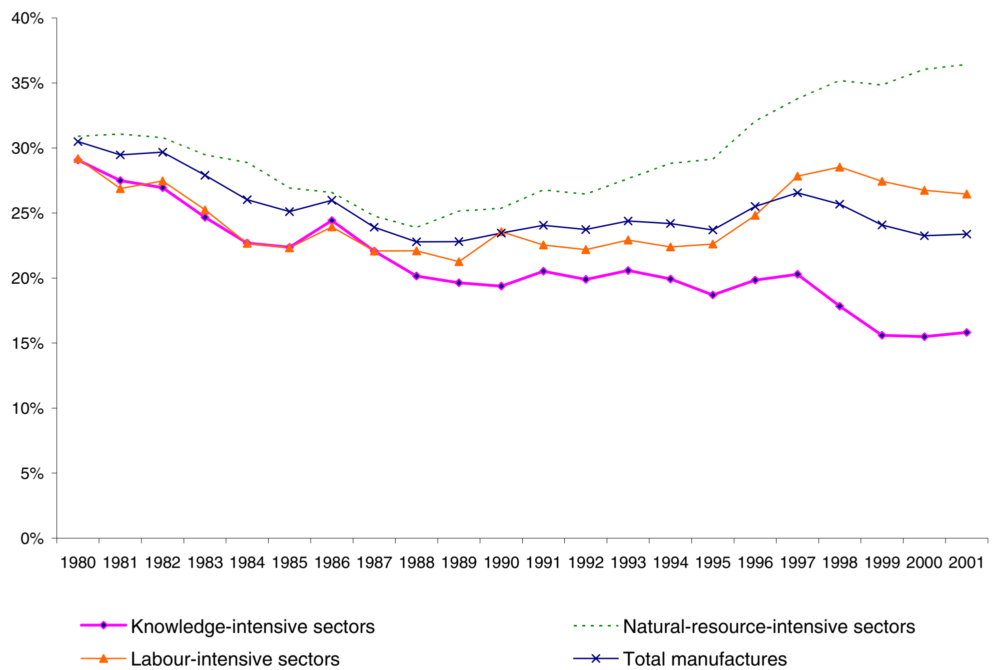
One way to interpret these data is to view them as a reflecting what each economy has done with its earnings from natural resources (ECLAC, 2007e). Today's developed countries use such revenues as a basis for diversifying and integrating their production structures, by strengthening the role of engineering-intensive sectors which also feed back into learning processes and innovation in the natural-resource-based sectors. As Latin American countries historically have not made a similar effort, they display weaker performance indicators in terms of economic growth, structural change and technological innovation.

The effects of the change in the production structure and in the manufacturing sector are revealed in the productivity trends displayed by different sectors of specialization. Figure II.14 shows the trend of manufacturing labour productivity in the region (compared to that of the

[19] In Argentina and Uruguay, this observation may be affected by the critical situation faced by their economies during the comparison period.

United States) by sectors of specialization. As a result of the lesser dynamism of engineering-intensive industries, the relative labour productivity of knowledge-intensive manufactures is declining. Labour-intensive activities, whose relative productivity trended downward in the 1980s, probably as a result of the crisis at that time, remained stable throughout the 1990s and have recently been displaying more dynamic trends. In contrast, natural-resource-based activities have shown the greatest relative vigour since the late 1980s and are steadily closing the productivity gap.

Figure II.14
RELATIVE LABOUR PRODUCTIVITY IN LATIN AMERICA COMPARED TO THAT OF THE UNITED STATES, BY SPECIALIST MANUFACTURING SECTOR, 1980-2001 [a]
(Percentages)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of the Industrial Performance Analysis Program (PADI), Santiago, Chile, 2005.

[a] The following eight Latin American countries are considered: Argentina, Bolivia, Brazil, Chile, Colombia, Mexico, Peru and Uruguay. For details of the sector groupings see Katz and Stumpo (2001).

Apart from the strong performance of natural-resource-based manufactures, the progress of general purpose technologies over the last two decades opens a new way to strengthen the growth of natural-resource-based sectors and their manufactures, a topic that is analysed in detail in chapters IV and V. Nonetheless, additional conditions are needed to generate a virtuous process involving innovation, creation of new products, processes and capacities, and productivity increase in these sectors (see Box II.1 and chapter III).

Box II.1

NATURAL RESOURCES AND GROWTH: OPPORTUNITY OR "CURSE"?

The effect of the natural resource endowment on growth has often been the subject of controversy, sometimes being viewed as a source of problems and other times as a source of opportunities (see, among others, Sachs and Warner (1997, 1999 and 2001) and Sachs and Rodríguez (1999), on the curse of natural resources; and Ferranti and others (2002) and Machinea and Vera (2007) for an analysis of production potentials in economies based on an abundant primary sector). Arguments in the first case include: the depressive effects that natural-resource abundance may exert on the profitability of other activities that have greater growth potential, target more stable and dynamic segments of world demand, display greater linkages with domestic production, higher technological content and value-added, and which would create fewer opportunities for rent-seeking behaviour. The second point of view emphasizes the contribution of natural-resource-based activities as a source of foreign exchange, the increasingly technological nature of production processes, the spillover effects they could have on the rest of production and, more recently, the renewed buoyancy of their markets following the entry of new actors on the world economic stage.[a] Clearly, it will always be possible to argue casuistically and find examples of different countries to support one opinion or the other. From a practical standpoint, however, it is more useful to find ways to prevent the adverse effects from materialising and to make the most of the positive growth consequences.

The experience of several of today's developed countries, and of some developing countries also, in which natural-resource-based activities are or were important for their production structure and exports, and which have managed to move towards other production specializations or grow relatively steadily, makes it possible to propose guidelines to neutralize the potential negative effects and make the most of the positive aspects of a natural-resource-based economy.[b]

The experiences of those countries include the following elements, among others:

(i) A macroeconomic framework that makes it possible to apply countercyclical policies and cushion the effects of fluctuations in export prices.

(ii) Mechanisms that promote the creation of domestic linkages, ranging from the creation of production *clusters* through to efficient import substitution.

(iii) Policies aimed at new skill acquisition and human capital development aimed at moving into knowledge-intensive activities.[c]

(iv) Creation of an innovation-friendly environment, ranging from support for research and development to the existence of the institutions needed to finance the creation, expansion and consolidation of new enterprises.

(v) Institutional coordination mechanisms including the various agents that participate in formulating strategies and adopting agreements (Government, firms, universities, citizen organizations).

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

[a] Innis (1930 and1940); Watkins (1963); North (1966) and MacLean (1989) refer to this virtual circle between the primary base, industrialization and growth in the case of the so-called "western offshoots".

[b] These countries include Australia, Canada, Finland, New Zealand, Sweden and the United States. In the Latin American region, Chile has achieved relatively stable growth over last 15 to 20 years, despite its natural-resource specialization.

[c] Bravo-Ortega and De Gregorio (2005) find that the natural resource endowment exerts a negative effect on long-term growth, but argue that its effect on human capital accumulation is positive and statistically significant, which would offset, and even reverse, the "curse" effect of natural resources on growth.

2. The revitalization of the production structure and its effects on growth

Economic growth is simultaneously the outcome and cause of changes in the structure of production and markets; changes in demand and in the appearance of new products, services and firms; and the decline of those that fail to remain competitive against new entrants and in the face of rapid technological change. One of the key determinants of diversification of production is innovation, broadly defined as including not only radical changes but also small improvements in product design and quality, in the production process and in its organization, marketing and logistics. This process, in turn, is a function of capacities to create, learn and adapt knowledge and techniques to the productive and commercial domain, possibilities for capturing the greater value-added created by those innovations, and the availability of resources (material, human and financial) that the innovations require (Ocampo, 2005b). Several of these aspects are the responsibility of private and public institutions that collectively form the setting for innovation, and whose design and governance affect the efficacy with which they fulfil their purpose.

The intensity with which the momentum of innovation translates into growth depends on the depth of learning and complementarity relations between innovating agents and the rest of the production apparatus. The greater the generation of knowledge and linkages with the rest of the production structure, the greater will be the impact of innovation on productivity and growth (Ocampo, 2005b; Porta, 2006). Nonetheless, production linkages between innovating activities and the rest of the economy may be affected by high levels of uncertainty, information difficulties and coordination failures, such that spontaneous market action generally results in suboptimal levels of complementarity generation, particularly in less developed economies in which the innovation setting is usually at a very embryonic stage and innovation and changes in the production structure have less effect on growth.

A key objective of a proactive strategy to revitalize the production structure and empower its effects on growth should be to strengthen systemic competitiveness, with the emphasis on incorporating knowledge as the main sustainable source of competitiveness, while recognising that this does not stem just from the individual performance of one firm, but also from interaction with the rest of the production apparatus. Bearing in mind the imperfections and externalities associated with the systemic nature of competitiveness that affect innovation and learning processes and their dissemination, public action, in conjunction with the various private agents participating in processes of innovation and productive change, plays a key role in constructing a virtuous circle between innovation, changing production patterns and growth (Ocampo and Martin, 2003a). There are three key factors for strengthening systemic competitiveness: knowledge generation and its application to the production sphere, diversification of the production structure and efficient provision of infrastructure services.

(a) Knowledge generation and its application to the production sphere

The capacity to create, learn and adapt knowledge to production plays a strategic role in current production and technological patterns. From the standpoint of the needs of growth, and in keeping with the progress of modern science and culture, this requires a critical review of the characteristics of education systems, research and development (both public and private) and their interaction with business. The fact that Latin America and the Caribbean displays shortcomings in nearly all areas helps to explain the region’s backwardness.

As Chapter III makes a more detailed analysis of investment in research and development, it suffices here to note the abundant evidence showing that the region has inadequate levels of investment and very little penetration of information and communication technologies (Peres, 2008). The vast majority of the region’s countries spent less than 0.2% of GDP on research and development between 1997 and 2004; and even those that invested most spent less than their counterparts in other regions. The advanced economies invested an average of 2.4% of GDP on research and development during that period, led by Israel which spent 4.5% in 2005.[20]

Given the high risk involved, innovation initiatives require a setting based on specialised systems of subsidies and private funding, which can take on new risks sustainably and promote linkages between entrepreneurs and markets. Several developed countries have such systems in place, but the efforts of the region in this regard are still incipient. Brazil has taken a comprehensive approach, establishing stable public funds to support the creation of new products and businesses. It has also passed a law stimulating interaction between the public and private sectors in the innovation process; and it has created new private capital market segments that facilitate support for new initiatives. Chile and Mexico have also been moving along a similar path, although they are at a less advanced stage (Jiménez, 2006 and 2007).

[20] Estimates based on figures from the Ibero-American Network of Science and Technology Indicators and the World Bank, World Development Indicators [online database]. See also OECD (2007b). The advanced economies consist of 22 OECD countries.

Much has been written about the empowering role of education, ranging from the pioneering microeconomic analysis of Mincer (1974) to the more recent proposals of growth theory (Lucas, 1988; Mankiw, Romer and Weil, 1992). Although the empirical evidence is inconclusive, it can be said that from the growth standpoint, a higher education level would make it possible to take greater and better advantage of available technologies, particularly at lower relative development levels. Nonetheless, the corresponding strategy should be based on a systemic view that takes account of the needs of the supply of and demand for educated labour, i.e. human capital formation should go hand-in-hand with a diversification of the production structure that increases the demand for it.[21]

More recently, Hanushek and Wosmann (2007) have reviewed a set of studies that stress the importance of education quality rather than quantity. According to these authors, education quality has potent effects on individual incomes, the income distribution and economic growth. Merely channelling additional resources into the education system, on the other hand, is no guarantee of success. They also point out that the relative backwardness of developing countries is much clearer in terms of quality than quantity.

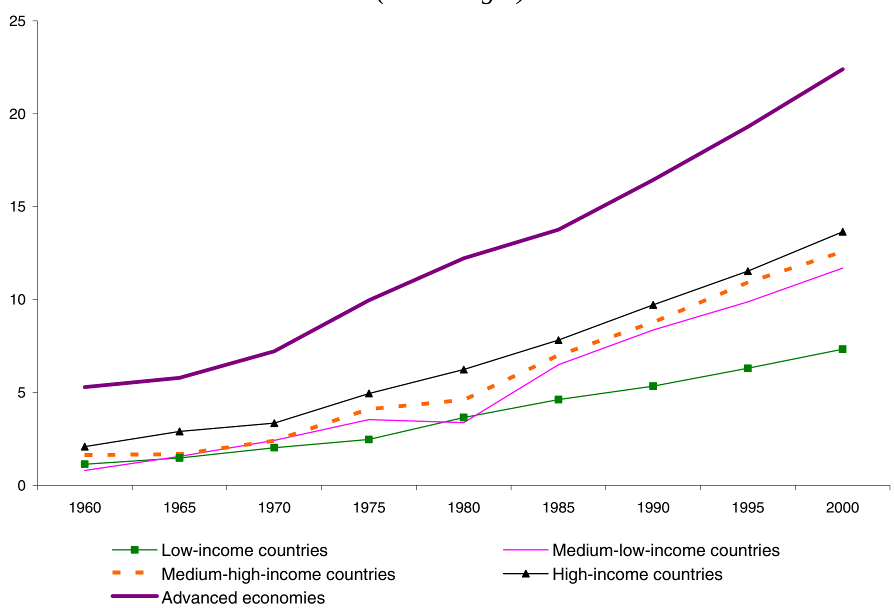
Latin America and the Caribbean also fits this description. Despite progress in terms of educational coverage up to secondary school level, education quality indicators, such as internationally standardized examinations that measure performance in certain areas, reveal clear shortcomings. In fact, all of the region's countries that participate in the Programme for International Student Assessment (PISA) are among the worst performers (OECD, 2007b; ECLAC, 2007e).

There is also significant lag in terms of professional training, especially in the region's relatively poorer countries. Figure II.15 shows that even the more advanced countries in the region are 20 years behind their developed counterparts. Moreover, in the relatively poorer countries the percentage of the population with higher education is increasing very slowly, thus accentuating the gap with respect to the other countries in the region.

Figure II.15

POPULATION WITH HIGHER EDUCATION IN LATIN AMERICA AND THE CARIBBEAN AND IN DEVELOPED ECONOMIES

(Percentages)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of Organisation for Economic Co-operation and Development (OECD), *PISA 2006 Science Competencies for Tomorrow's World*, Paris, December 2007.

[21] The tension between the existence of skilled labour and the absence of greater demand for it is often "resolved" by talent migrating from developing countries to developed ones.

(b) Diversification of the production structure

The diversification of the production structure takes three main directions in the current situation: (i) export diversification in terms of goods and markets; (ii) exploiting linkages by developing national supplier networks, for inputs, logistics and engineering;[22] and (iii) the formation of production *clusters*.[23]

Some data show that Latin American and Caribbean countries are not exploiting the economic-growth potential of exports to the full. One of the indicators of complementarity between foreign trade and the production structure measures the effects of exports in generating value-added. Although the available indicators are limited, an approximation can be obtained by considering the behaviour of the export and production structure through time.

Figure II.16 shows the share of tradable sectors in exports and value-added by type of goods in nine of the region's countries for 1990 and 2002. In several cases, particularly those relating to exports of low, medium and high technological content, the larger export share has not been matched by significant increases in the generation of value-added. This reflects modes of external engagement based on maquila with intensive use of imports, or technological operations with low levels of linkage with the rest of the production system (see chapter V). Nonetheless, these activities have generated significant demand for labour and can be seen as a gateway to global value chains, which would subsequently make it possible to move up the hierarchy and generate greater value-added. This has been the experience of several countries in East Asia.

Developing countries currently face different kinds of difficulty in providing incentives for the development of production linkages. Firstly, current international trade regulations significantly reduce possibilities for protecting the national market as a mechanism for promoting the development of domestic production, except in the poorest countries. As a result, a rising proportion of world trade is undertaken by firms belonging to global value chains. These basically direct exports, both finished products and intermediate components, so as to optimize the organization of production and commerce on a global scale by exploiting economies of scale or geographic location. This does not mean that there is no possibility for upscaling in global chains. On the contrary, as discussed in chapter I, section C, these global chains permit, and often stimulate, the creation of capacities that can facilitate innovation and productive diversification.

Accordingly, given institutional constraints and the new reality of international trade, the measures taken in the public domain need to be based more on coordination strategies between public and private agents, so as to reduce uncertainties and overcome the information shortcomings that slow down the creation of firms, products and services.

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[22] In some cases it is possible to exploit the non-tradable nature of some services, which require proximity and knowledge between the customer and supplier, e.g. certain financial and logistics services. The creation of "forward" productive linkages requires the innovating supplier to create a reputation for reliability and cost-effectiveness, to be competitive with imports. In both cases, one of the key aspects entails raising levels of contractual fulfilment to reduce the uncertainty that impairs innovation and investment processes.

[23] For an analysis of different types of clusters in Latin America, see CAF (2006) and ECLAC (2004a).

Figure II.16
STRUCTURE OF EXPORTS AND GDP OF THE TRADABLE SECTORS, LATIN AMERICA, 1990 AND 2002 [a]

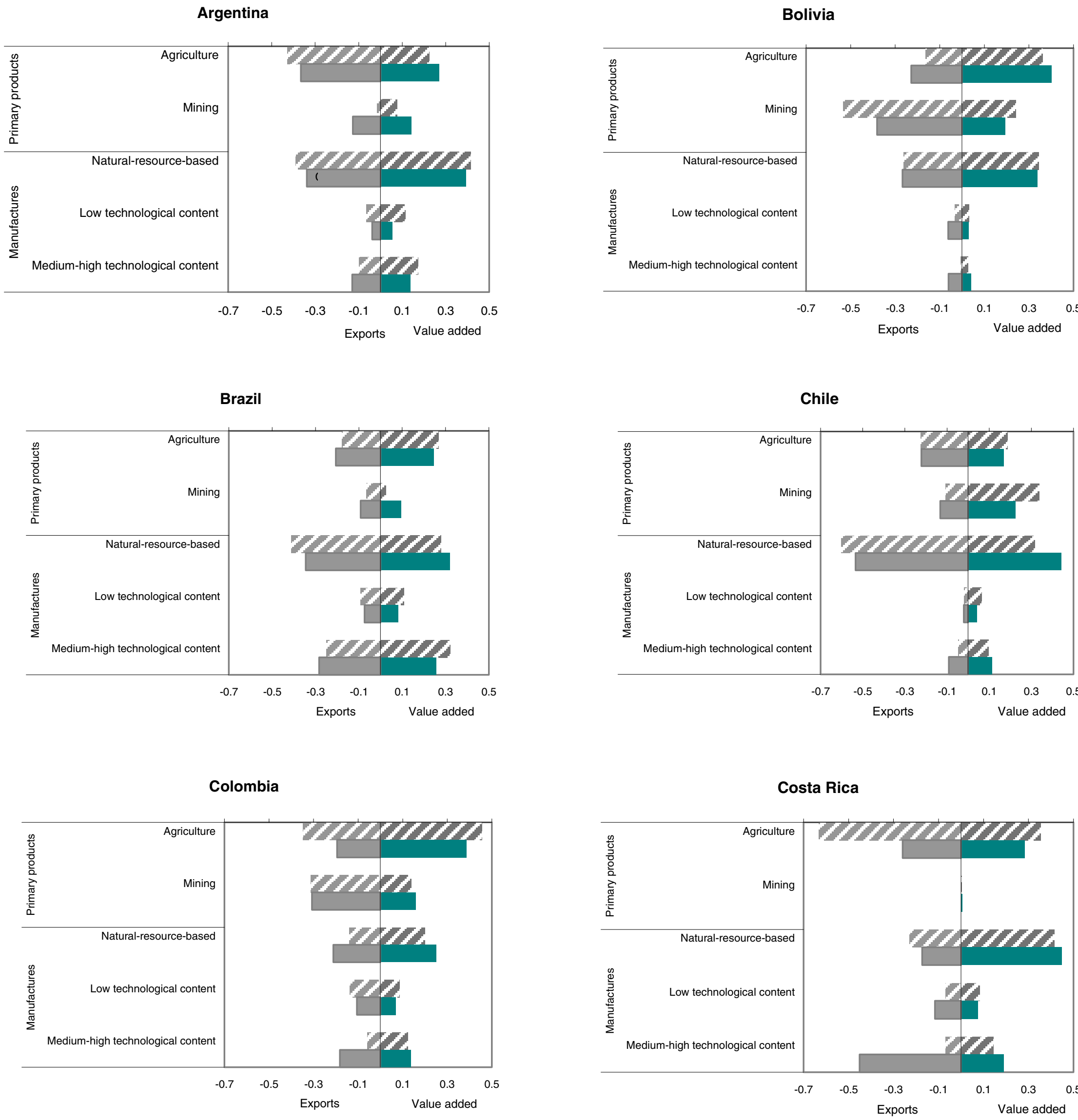
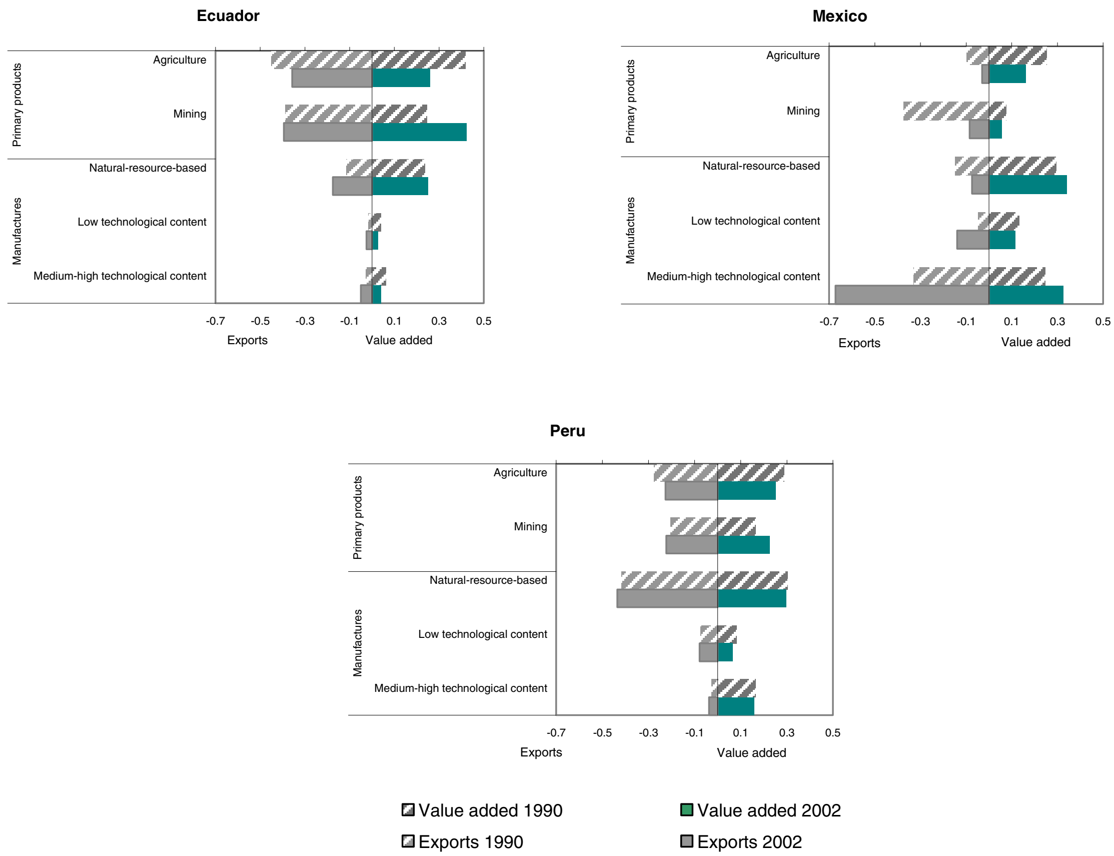


Figure II.16 (concluded)



Source: United Nations Development Organization (UNIDO); United Nations Commodity Trade Database (COMTRADE).

[a] These figures were prepared using the available data closest to 1990 and 2002.

(c) Efficient provision of infrastructure services

Efficient provision of infrastructure services has a major effect on the capacity of different sectors to compete. The region's infrastructure in areas such as roads, port services, telecommunications, energy and health services has changed significantly over the last few decades, but in degrees that vary from country to country. The most outstanding feature is the greater presence of the private sector in financing and service provision, alongside the privatization of State enterprises in the 1990s and, more recently, through long-term concession contracts. Although the State maintains a presence as an agent of production in several areas, it has progressively assumed the role of regulator and guarantor.

Although progress has been made, the infrastructure gap with respect to the more advanced countries remains large in various areas (see table II.2). This firstly reflects the low rate of growth of public infrastructure investment since the mid-1980s, as can be seen in figure II.3 of the previous section. Secondly, private investment in infrastructure, albeit dynamic in certain areas such as telecommunications, has not fully made up for the reduction in public investment. This reflects the general factors of instability and low growth analysed above, compounded by the considerable institutional challenges involved in establishing a new regulatory and financing framework for private investments in areas that are often monopolies.

Table II.2
INFRASTRUCTURE CAPITAL STOCK
(Simple averages)

	1970 [a]	1980	1990	2000	2004
Electric power [b]					
Latin America and the Caribbean [c]	0.50	0.82	1.37	1.98	2.07
OECD [d]	4.68	6.66	8.46	10.13	10.58
Telecommunications [e]					
Latin America and the Caribbean [c]	27.14	35.06	56.44	231.35	554.47
OECD [d]	244.41	310.20	467.36	1 173.73	1 483.10
Transport [f]					
Latin America and the Caribbean [c]	0.68	0.84	1.18	1.21	1.22
OECD [d]	8.40	10.67	11.28	11.76	11.56
Access to drinking water and sanitation [g]					
Latin America and the Caribbean [c]	…	…	63.6	73.7	76.0
OECD [d]	…	…	100	100	100

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of World Bank, World Development Indicators [online database]; and World Health Organization (WHO)/United Nations Children's Fund (UNICEF), Joint Monitoring Programme for the Water and Sanitation Sector [online] http://www.wssinfo.org/.

[a] The figure for electric power corresponds to 1971 in the case of Latin America and the Caribbean.
[b] Generating capacity in megawatts per hour per inhabitant.
[c] Number of fixed and cellular telephones per 1,000 inhabitants.
[d] Kilometres of paved roads per capita.
[e] Includes Argentina, Bolivia, Bolivarian Republic of Venezuela, Brazil, Chile, Colombia, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, and Uruguay.
[f] Includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Norway, the Netherlands, New Zealand, Portugal, Republic of Korea, Spain, Sweden, Switzerland, the United Kingdom and the United States.
[g] Percentage of the population with access to drinking water and sanitation.

The State is facing major challenges —both in adequately regulating the infrastructure service enterprises that were privatised, and in establishing long-term concession contracts— which require a learning curve and institutional reforms to overcome. Firstly, institutions are needed that are capable of anticipating demands in various areas and deciding on the best ways to achieve adequate levels of service, in terms of both quality and coverage, preventing private investment from targeting only higher-income sectors or those of high private profitability. Secondly, the foregoing needs to be complemented with service costs that allow for an adequate return on private infrastructure investment, without undermining the competitiveness of other sectors. As these are almost monopoly sectors, competitive conditions need to be created when tendering a concession, together with a transparent pricing scheme and an expeditious dispute settlement system. Lastly, to facilitate least-cost financing, a system of contingent guarantees and insurance needs to be set up to distribute the risks between the private sector and the State, without exceeding the latter's capacity to fulfil commitments.

Nonetheless, while the private sector can make a significant contribution to infrastructure development, the public presence will remain crucial in certain areas, so strengthening public finances to increase State investment will continue to be a high priority.

C. Exports and growth

Export growth over the last two decades has displayed two characteristics. Firstly, as noted in section A of this chapter, exports have grown faster than in previous decades. Nonetheless, as indicated in the previous section, this more dynamic performance does not seem to have had much effect on the pace of overall economic growth (ECLAC, 2004a). As the experience of other countries —especially those of East Asia— has been different, it is worth considering the reasons that explain the limited "pull-along" effect of Latin American and Caribbean exports, and, in particular, how exports can be harnessed as a source for changing production patterns and economic growth.

This section stresses the potential contribution of exports to changes in production patterns and growth, and starts by distinguishing between exports and trade liberalization. The latter involves a lowering of import barriers, either by eliminating nontariff barriers, or by reducing tariffs.[24] While the positive effects of exports on economic growth seem to be uncontroversial, as noted in the previous section, the repercussions of trade liberalization are much more uncertain and depend on a set of factors that include historical and geographical context, the speed with which the policy is implemented, its scope (sector or global), complementarity and linkages with other reforms (e.g., capital account liberalization), restructuring capacity in certain sectors, the existence of mechanisms to compensate losing sectors, and flexibility in the financial sector and labour market.

1. Global growth

Although Latin America and the Caribbean's share of world trade has not changed greatly over the last 45 years, two distinct periods can be identified. In the first period, from the 1970s until the 1980s, the region's share decreased substantially; in the second, from 1990 to the present day, a considerable recovery has made it possible to approach the levels of 45 years ago (see figure II.17).[25] The value of regional exports has grown appreciably, particularly since 2003, as a result of burgeoning world demand for several commodities. This pattern contrasts with that seen in the emerging Asian countries, whose world trade share has grown steadily from 1% in 1960 to over 5% today. In contrast, the share of world trade accounted for by members of the Organisation for Economic Co-operation and Development (OECD) has declined, as has natural-resource-intensive production. The OECD countries' share of world trade fell from 72% in 1990 to 62% in 2006.

In the Latin American and Caribbean region, Mexico, and recently Brazil, were the most dynamic economies of the period. Until 1990, exports from Andean countries —excluding the Bolivarian Republic of Venezuela but including Chile and Argentina —grew by less than world trade as a whole, but have increased over the last decade and a half. The least buoyant countries were the Bolivarian Republic of Venezuela, which failed to regain its share despite the oil boom, along with Central America, the Caribbean, and the rest of MERCOSUR.

There are different dynamics in worldwide trade in commodities, on the one hand, and manufactured products on the other (see figure II.18). In the first case, the region's share has remained virtually constant, whereas it has increased by two percentage points in the case of manufactured goods. Mexico's contribution far outweighs that of the other countries, doubtless related to the effects of the free-trade agreement signed with the United States and Canada.

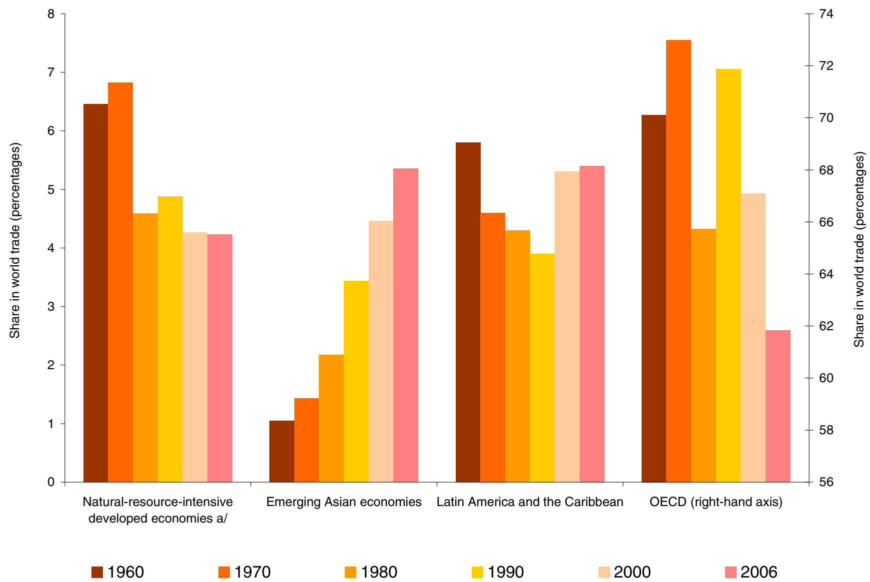
Box II.2 considers the trend of the region's merchandise exports compared to the growth of world trade. The analysis shows that while Latin American exports still mainly consist of goods whose world trade share has declined, in recent decades the region has significantly increased its share of trade in the most dynamic goods. This largely reflects Mexico's larger volume of exports of products with very buoyant markets, whereas the Andean countries and Chile have lost their share of world trade in goods for which demand is growing most strongly. The situation of Chile is atypical in this subgroup, because it has greatly increased its presence in markets for products whose world trade share has decreased (falling stars). Lastly, although the region as a whole saw its exports of the least buoyant goods decline, in Central America the opposite occurred, since its share of world trade in this type of goods increased in both periods.

[24] Naturally, export growth leads to an increase in and consequent liberalization of imports. The difference with respect to general tariff reduction is that the latter initially generates a larger increase in imports and only later in exports. As shown by the Asian experience, the effects on the productive structure of lowering import barriers may be completely different from those caused by an increase in exports.

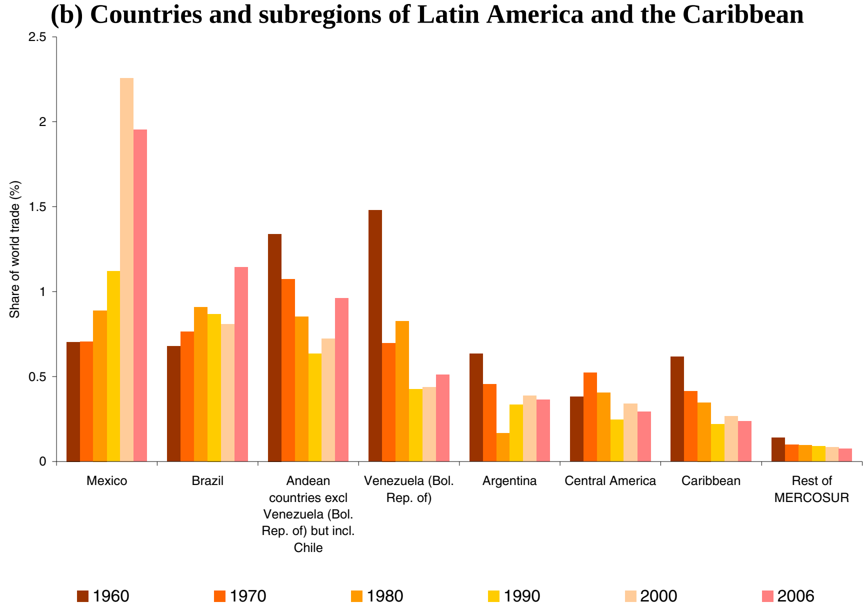
[25] The share of Latin American and Caribbean exports in world trade varied from 5.4% in 1870 to 5.1% in 1913 and 8.5% in 1950 (Maddison, 2006). Nonetheless, the figure for 1950 is artificially high because of the small volume of world trade at that time, given that the European countries, the United States and Japan had not fully recovered from World War II.

Figure II.17
SHARE OF WORLD TRADE IN GOODS AND SERVICES, 1960-2006

(a) Latin America and the Caribbean and other regions



(b) Countries and subregions of Latin America and the Caribbean



Source: World Bank, World Development Indicators [online database].

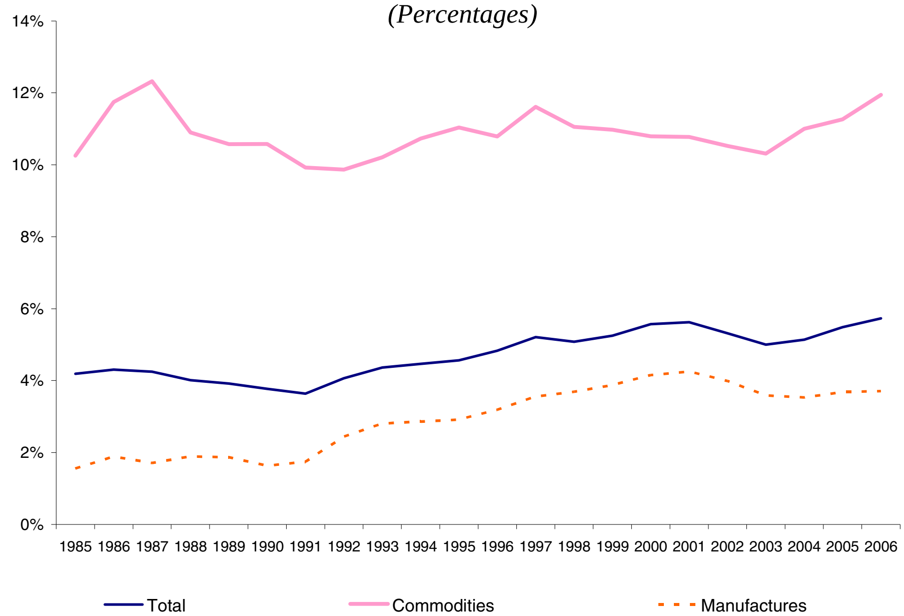
[a] Australia, Canada and New Zealand.

[b] Philippines, Malaysia, Republic of Korea, Singapore, Thailand and Viet Nam.

Figure II.18

LATIN AMERICA AND THE CARIBBEAN: SHARE IN THE VALUE OF WORLD EXPORTS

(Percentages)



Source: United Nations, Commodity Trade Database (COMTRADE).

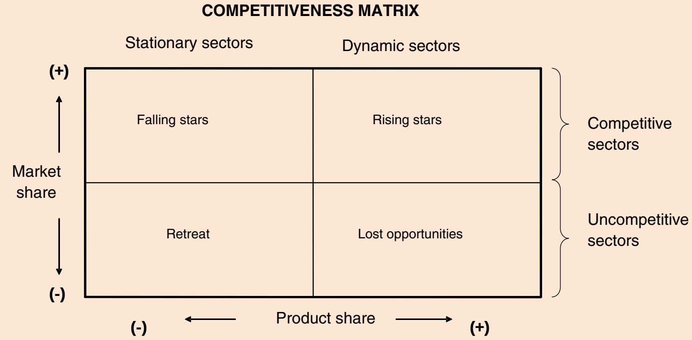
Box II.2

COMPETITIVENESS OF LATIN AMERICAN EXPORTS

A country's export competitiveness is measured in two stages. Firstly, world trade is divided into two groups: products whose growth was more robust than the average and those whose growth was weaker. Secondly, the exports of a given country in the initial year are also divided into two groups depending on whether or not the country increased its share of global trade in a given product between the initial and final years. From the standpoint of its export growth, the ideal for a country is to increase its presence in markets for products for which demand is growing faster than the world trade average.

The two aspects together make it possible to distinguish four types of product in the competitiveness matrix. The best case corresponds to "rising stars", i.e. dynamic products subject to increasing global demand, in which the country's competitiveness has enabled it to increase its market share. This group is followed by "lost opportunities" i.e. dynamic products in terms of global demand, in which the country is not sufficiently competitive with the rest of the world, so its market share declines. The third corresponds to "falling stars", or products that are declining on the world market (stagnant demand), but for which the trade share of the country in question is increasing. For a small or medium-sized country, positioning in this type of goods could be a profitable strategy in the short and medium terms, but not so much in the long term. The fourth and worst situation is that of "retreat", corresponding to products that are stagnant on the world market and in which the country's trade share is declining.

COMPETITIVENESS MATRIX

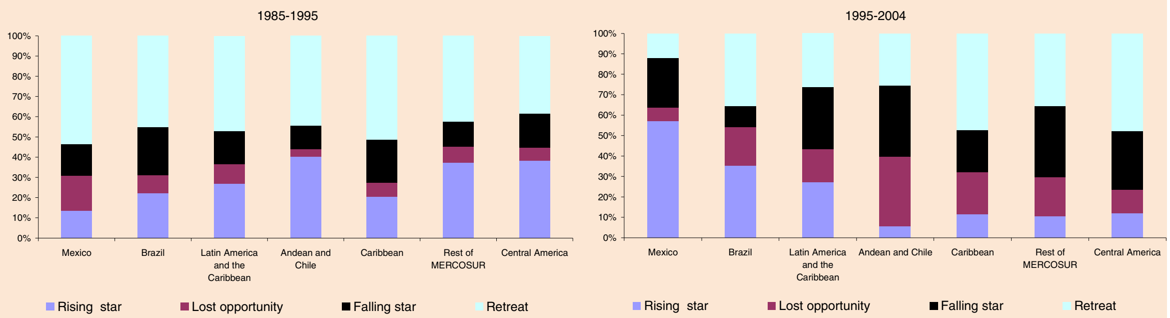


Source: Economic Commission for Latin America and the Caribbean (CEPAL), CAN2000: User guide [online] www.eclac.org/softwareCAN2000.pdf.

Box II.2 (concluded)

The analysis covers two periods: 1985-1995 and 1995-2004. The following figures show the world trade growth dynamic of each country's or subregion's export basket in the initial year. In the decade 1985-1995, 60% of products exported from the region lost importance in world trade. This uncompetitive position tended to improve between 1995 and 2004, as the market share of a larger proportion of strong-growing products increased. This largely reflected results recorded in Mexico and Brazil between the two periods studied. Almost 60% of products in the Mexican export basket in 1995 increased their share of world trade, while the country's share in the corresponding markets increased. Secondly, in 1995-2004, over half of all exports from Mexico and Brazil were dynamic on the world market. Moreover, Mexico and Brazil (albeit to a lesser extent) increased their share in these markets (rising stars). In contrast, Central America, the rest of MERCOSUR and the Caribbean display an unfavourable specialization pattern in terms of the evolution of the structure of world trade, since their share in stagnant markets has increased.

GROWTH OF LATIN AMERICAN AND CARIBBEAN EXPORTS



Source: Economic Commission for Latin America and the Caribbean (ECLAC), Competitive Analysis of Nations (CAN) software.

2. Diversification

Before analysing the region's export diversification, it is worth pausing to consider the significance and relevance of this phenomenon for growth. Why might it be preferable to diversify exports instead of specialising in activities where there are static comparative advantages stemming from the country's endowment of production factors, natural resources and capacities?

Firstly, export diversification is beneficial in itself, since it helps to reduce terms-of-trade variability and, as seen in chapter I, it also cushions the effects of real external crises.[26]

Secondly, export diversification is usually closely related to changes in production structures which tends to promote knowledge incorporation, as discussed in the preceding section.

Lastly, export diversification can help create new comparative advantages. International data show that in many cases these are obtained by entering new fields of activity, based on a learning process stemming from direct production experience, investment in physical and human capital and institutional development. In addition, the pace of change in comparative advantages has increased thanks to globalization and the acceleration of technological change and its dissemination. This means that to prevent either their natural or acquired advantages from being eroded, countries must invest in production and export diversification to capture the benefits of entering new products and markets, before others do so.[27]

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[26] This means that diversification should involve an expansion of the export basket in terms of goods and markets that are imperfectly and negatively related among each other, or for which international prices vary less.

[27] The concept of competitive advantage relates to the exceptional gains that a country can obtain, thanks, among other things, to its privileged position —e.g., geographic— with regard to world markets, earlier progress than others on the learning curve or on the cost curve of an industry with dynamic scale economies, and constant introduction of factors that differentiate it from other producers.

Three aspects of export diversification are considered below: diversification by products, markets and a combination of the two. The region still has major potential for deepening its export diversification; and the introduction of new destination markets and products is a major source of export growth, particularly in the long term.

(a) Diversification of products

As figure II.19 shows, although the region diversified its export basket between the mid-1980s and the start of this century, the process has gone into reverse over the last few years.[28] This reflects the rise in commodity prices and consequent increase in the weight of commodities in the export basket. The trend is confirmed, particularly in the Andean countries and Chile, where the rise in mineral and oil prices as from 2003 has eroded the export diversification that had occurred up to 2002.[29] A similar, albeit less intensive, situation can be seen in Paraguay and Uruguay. Mexico and Central America, and to some extent the Caribbean, significantly diversified their export basket, with an increasing share of medium- and high-technology products and an ever smaller share of commodities. Consequently, the level of export concentration in these countries did not vary much as a result of the commodity price boom. In the larger countries, such as Argentina, Brazil and Mexico, which have more complex production structures, their export diversification was greater. Nonetheless, their export prices improved by much less than those of the Andean countries (see section A).

Having said that, the region's exports are generally less diversified than those of other countries, mainly because they are more concentrated on commodities and natural-resource-based manufactures. When commodities are excluded (see part (b) of figure II.19), the concentration index is cut by half, and is even below that of other parts of the world.

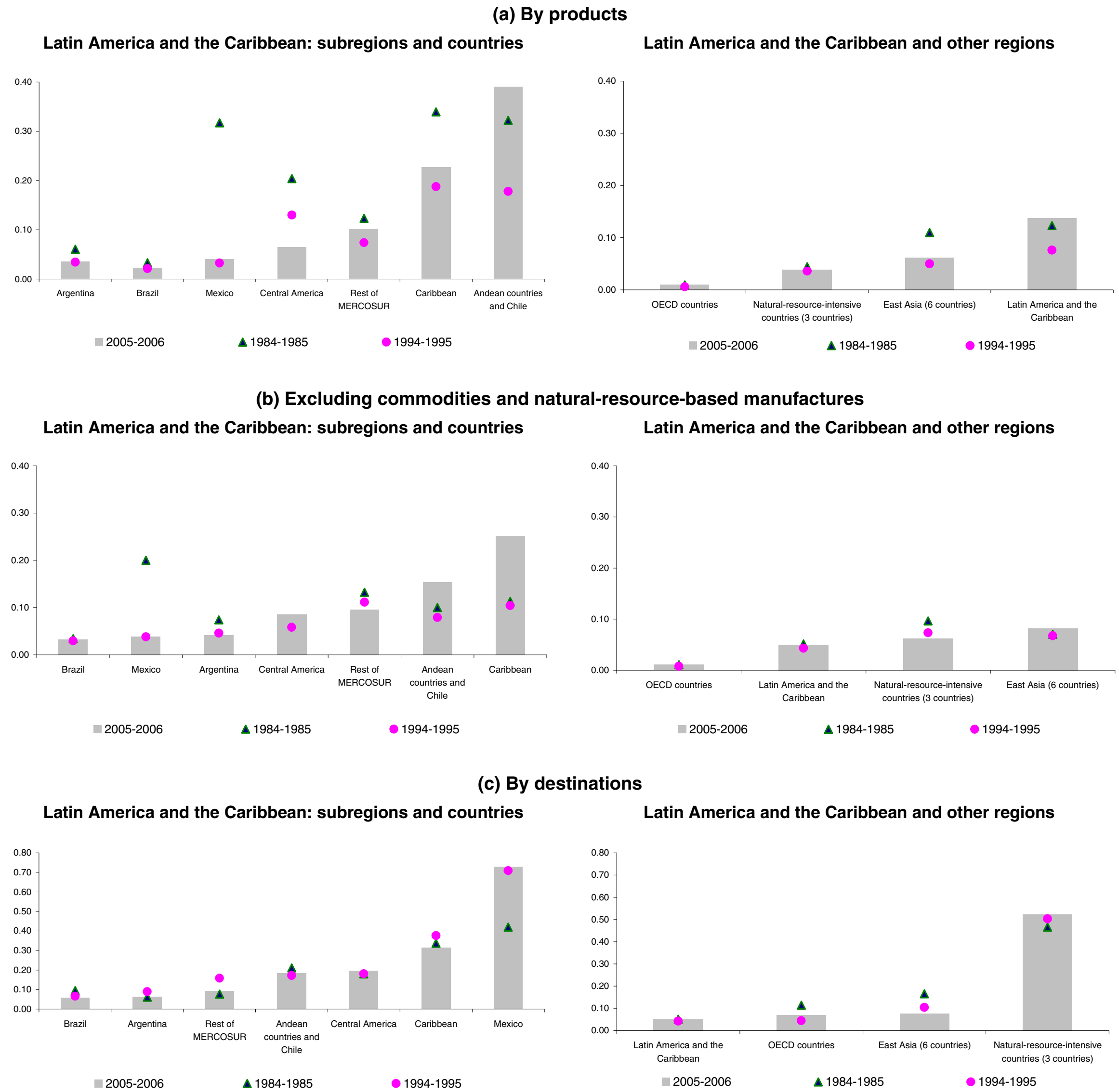
(b) Diversification of destination markets

Another aspect of export diversification is an increase in the number of geographic or market destinations. Geographic diversification also entails portfolio advantages, since it helps to offset the risk of fluctuations in a specific market. Moreover, the fact of exporting to different markets generates externalities related to the preferences and demands of consumers from different countries. As shown in figure II.19c, levels of concentration by destination largely depend on the country's distance from its trade partners and their economic size (gravitational forces), which have not varied much. South America displays very deep geographic diversification, in fact more than other regions of the world. In contrast, the geographic proximity of the United States market has a major influence on trade concentration in the cases of Mexico, the Caribbean and Central America. Latin America and the Caribbean is the world's most diversified region in terms of markets, even surpassing OECD countries.

[28] The Herfindahl-Hirschman index measures export concentration in nominal rather than real values. Consequently, when commodity prices rise, the index shows less diversification in countries that export this type of product.

[29] Between 2002 and 2006, the highest export concentrations were registered in the Bolivarian Republic of Venezuela, Ecuador and Chile, while concentration was least in Bolivia. The concentration index rose from 0.61 to 0.81 in the Bolivarian Republic of Venezuela; from 0.20 to 0.35 in Ecuador; and from 0.08 to 0.18 in Chile.

Figure II.19
EXPORT CONCENTRATION MEASURED BY THE HERFINDAHL-HIRSCHMAN INDEX, 1984-1985 TO 2005-2006



Source: United Nations Commodity Trade Database (COMTRADE), on the basis of the Standard International Trade Classification, Revision 2 (SITC, Rev. 2), except in the cases of Mexico and Central America, which use Revision 1.

(c) The combination of products and destinations

To maximize the effects on growth and changes in production patterns, export diversification should include a simultaneous expansion of the product basket and an increase in the number of destination markets. The two facets are complementary for several reasons. Firstly, the combination maximizes the portfolio effects that help reduce the volatility of export earnings. Secondly, the simultaneous diversification of products and destinations helps firms to exploit the interdependences between their businesses and achieve scope economies. The capacity of a given firm to diversify its products also serves to deepen its international engagement, and vice versa (Stephan, 2002; Nachum, 2004). In the case of natural-resource exporters, however, the benefits of diversifying destination markets are less, since this type of product is already being traded, mostly on organized global markets.

Few countries and subregions of Latin America and the Caribbean have achieved a high degree of combined product and destination diversification (ECLAC, 2004a).[30] Although Mexico, the Central American nations and some Caribbean countries have significantly diversified their export products, their destination markets have become even more geographically concentrated (United States). Their internationalization largely features vertical integration in manufacturing chains, in which maquila activities play a major role.[31] The opposite is happening in the South American countries: exports remain concentrated in a few natural resource-based products, but are highly diversified in terms of destination markets. In this subregion, a distinction needs to be made between the Andean countries and the MERCOSUR bloc, since the Andean export basket is much more concentrated in terms of both destinations and products.[32] Exports from the third group, which consists of several Caribbean countries and Panama, are relatively concentrated in both product and destination terms.[33]

(d) The introduction of new products and destinations

Diversification achieved by introducing new products and gaining destinations has had a major influence on export growth, particularly in the long term (1985-2004), whereas its effects over shorter periods (1995-2004) have been relatively modest. Brenton and Newfarmer (2007) showed that three quarters of the growth of exports from Latin America and the Caribbean between 1995 and 2004 correspond to "intensive margins", i.e. an increase in exports of old products to old markets. They also found that entering new geographic markets contributed more to export growth than introducing new products. In a similar exercise for the period 1995-2005, Amurgo-Pacheco and Pierola (2008) confirmed that result for Latin America and the Caribbean and other regions of the world. In the case of "extensive margins", i.e. exports of new products and access to new markets, the diversification of geographic markets has been much more important than the introduction of new products, not only in Latin America and the Caribbean, but also in other emerging regions. Lastly, new mining products represent a third of this margin, and agricultural products almost a quarter.[34]

As shown in Box II.3, diversification has been much more important for the region over the long term (1985-1986 to 2005-2006). More than one third of export growth in this period corresponds to product diversification, and only one quarter to new destination markets.[35] Much of the region's product diversification is accounted for by Mexico. In fact, when the export figures for this country are excluded, geographic diversification becomes more important (41%) and the contribution made by product variety decreases.

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30 These patterns are not exclusive; this study refers to what has predominated over the last 20 years.

31 Vertical integration, also called vertical specialization, refers to the fragmentation of a sector's production determined between different countries and implies the import of intermediate goods for processing, sometimes only partial, and subsequent export to other countries.

32 Chile is a notable case in this context, since its exports are relatively concentrated in product terms, but are among the most diversified in terms of destinations.

33 These countries' foreign sales are dominated by tourism, financial and transport services.

34 It should be noted that these authors' analyses were performed at a relatively disaggregated level: five digits of the Standard International Trade Classification (SITC). Consequently, these studies underestimate the emergence of new products within each five-digit "line".

35 The joint contribution of product and destination diversification is greater than the total extensive margin, because it double counts the category of new products exported to new destinations. For a discussion of the reasons for this double counting, see Amurgo-Pacheco and Pierola (2008).

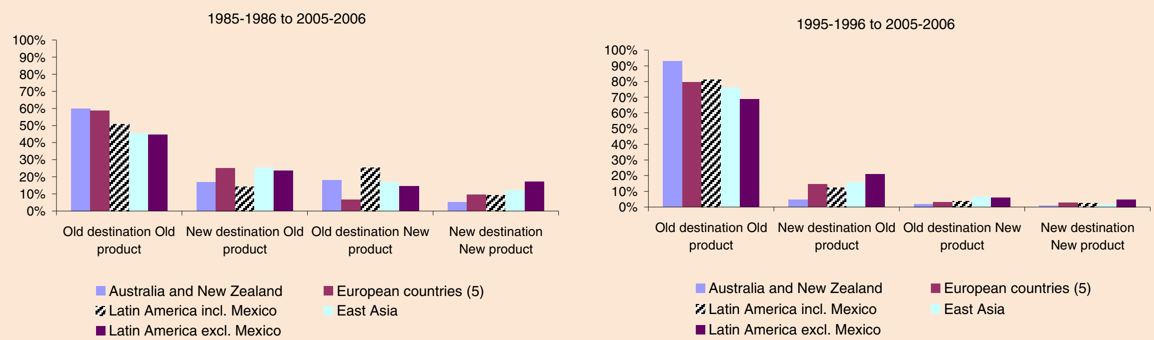
Box II.3

INTRODUCTION OF NEW PRODUCTS AND EXPORT DESTINATIONS IN THE MEDIUM- AND LONG-TERMS

To compare the importance of incorporating new export products and destinations over longer timeframes than those considered by Brenton and Newfarmer (2007) and Amurgo-Pacheco and Pierola (2008), this analysis was repeated for a longer period. Using a similar methodology, export growth was broken down (five digits of SITC) classified in four groups: old products and new ones (or "discoveries"), and old destinations and new ones. The criteria used to separate products and markets were as follows: new products were defined as those whose export value was less than US$1 million in the base year and above that in the final year. Old products were those of higher value in the base year, several of which grew, but some of which disappeared. The criterion for separating new and old markets was somewhat different, based on Amurgo-Pacheco and Pierola (2008), who argued that the discovery of new markets is a process that occurs at the sector rather than the country level. For example, if Peru exports copper to Germany, but at a given point in time adds broccoli to its export basket to that destination, this would represent a geographic discovery for the horticulture sector.

Using this classification, four types of diversification can be distinguished: (i) old products being exported to old destinations (OPOD); (ii) old products being exported to new destinations (OPND); (iii) new products to old destinations (NPOD) and (iv) new products to new destinations (NPND). Product diversification is equivalent to the sum of the NPOD and NPND categories, while destination diversification corresponds to the sum of OPND and NPND.

BREAKDOWN OF EXPORT GROWTH AS A PROPORTION OF THE TOTAL



Source: United Nations Commodity Trade Data Base (COMTRADE).

The results confirm that product and destination diversification has been greater over a 20-year horizon than during a single decade. In Latin America and the Caribbean as a whole, the introduction of new products and destination markets accounted for half of all export growth between 1985-1986 and 2005-2006, compared to just 20% in the period 1995-1996 to 2005-2006. When Mexico is excluded, diversification becomes even more important. In the period 1985-1986 to 2005-2006, exports of old products to new markets were the most important source of diversification for Latin America and the Caribbean. In contrast, when Mexico is included, the most important source is new products exported to old markets. Nonetheless, entry into new markets with new products accounts for 17% (10%) of regional export growth without (with) Mexico. In the "short" period, exports of old products to new markets were also more important in terms of the extensive margin.

In general, the importance of new products and geographic markets for the region's export growth varies greatly across countries. For example, in Argentina and Uruguay, new products and destination markets were more important than the regional average in the internationalization process; whereas other countries such as Chile and Peru increased their exports particularly in the intensive margin. Brazil and Mexico occupy an intermediate position.

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

To promote growth, not only exports but also imports need to be diversified, in terms of both product and origin.[36] The new theories of international trade and endogenous growth, supported by empirical studies, confirm that import diversification, particularly in the case of intermediate inputs and capital goods, helps to increase productivity, growth and income (Romer, 1990; Addison, 2003) (see Box II.4).

[36] In other words, external trade variety refers to the number of different products that a given country exports or imports, measured according to a detailed trade classification such as SITC or the Harmonized Commodity Description and Coding System (HS). Diversification refers more to the distribution of trade by different categories, which means that a country with a wide variety of exports or imports may not have diversified trade. Some analysts also consider the origin of imports as a source of variety for the country.

Box II.4

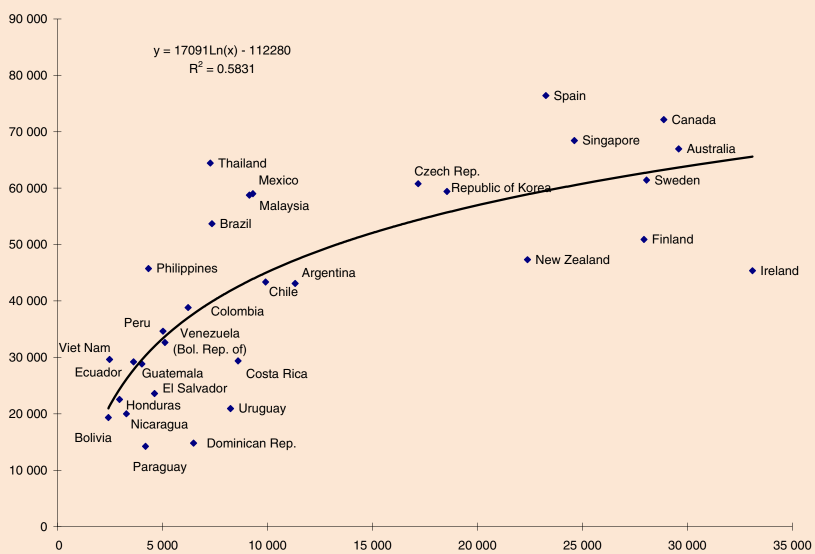
TOTAL VARIETY OF INTERMEDIATE INPUTS AND CAPITAL GOODS

As highlighted in the new growth and international trade theories, the variety of intermediate inputs and capital goods available in a given economy is closely related to the productive diversification process, level of productivity and per capita income. Variety is defined as the sum of imports of different products from different origins plus exports of different products sold to different countries. This is a two-way relation: variety affects productive diversification and productivity, and vice versa. Moreover, it is more important for developing countries than for advanced ones, since the range available in the latter is already close to the international frontier. A larger variety of imported inputs has similar effects to capital deepening or technological progress, since it reflects division of labour or a more complex production structure, which in turn entails product and process innovation. Various panel regressions show that, in conjunction with the rate of investment in physical capital, the variety of products available in a given country is a key variable for explaining differences in per capita income (CEPE, 2004).

The main ways to increase the variety of intermediate inputs and capital goods available in a given country are imitation, innovation and openness to trade. Countries that are far from the international frontier of varieties need to make significant imitation efforts, whereas countries that are closer need a high level of research and development to introduce new products. A number of econometric studies have shown that skills are a key factor for success in imitation. A country's skill base can be increased mainly through education, but also through the international mobility of skilled workers and FDI. In many cases, transnational firms hire a larger number of skilled workers and invest more in training than their local counterparts (CEPE, 2004). Moreover, a gradual process of trade liberalization, in conjunction with other production policies, can also help increase varieties by reducing import duties and non-tariff barriers. It should be noted, however, that rapid liberalization, such as occurred in the MERCOSUR countries in the 1990s and in Chile in the 1970s, can produce a contrary effect by destroying domestic capacity.

The figure below shows the relation between the variety of inputs and capital goods, both imported and exported, and per capita GDP. The total variety of products is calculated as the sum of the number of six-digit codes of the Harmonized Commodity Description and Coding System (HS) "used" by exports and imports, multiplied by the number of countries of origin of the products in question. There is a highly significant relation between the two variables. It is also notable that in most Latin American countries, apart from Brazil and Mexico, the variety of imports and capital goods is below the projected relation, whereas it is above the projection in several Asian countries.

VARIETY OF INTERMEDIATE INPUTS AND CAPITAL GOODS TRADED AND PER CAPITA GDP, 2004



Source: United Nations Economic Commission for Europe (CEPE), "The benefits from product differentiation in modern economies", *Economic Survey of Europe*, No. 1, Geneva, 2004.

3. The technological content of exports

The effect of exports on economic growth also depends on the content of value-added and the generation of linkages in the production structure. In turn, an increase in the proportion of value-added is sensitive to the technological content of the goods and services in question —a topic that is analysed in this section— and the extent of vertical differentiation based on product quality.[37] This issue is analysed in depth in chapter III.

(a) Goods

Generally speaking, compared to products of low technological content or those based on natural resources, the production and export of medium- or high-technology goods requires a higher level of physical and human capital and involves more innovation-intensive activities. Moreover, under current world production arrangements, products of this type are exported in the context of greater participation in global production networks, which offers the potential benefit of participating in more dynamic trade segments and exploiting the scale economies that characterize the sector's production. To judge by the trend of world trade, products of higher technological content have been the most dynamic, because the demand for them is expanding faster than trade overall (see chapter I). Under appropriate conditions, the production and export of more technology-intensive goods increases the possibility of revitalizing the domestic production structure. All of this means that the production and export of medium- and high-technology goods should be associated with higher rates of economic growth (Lall, 2000).

Over the last two decades, the region's success in incorporating technology into its exports has been highly varied. Mexico, and to a lesser extent Central America, have achieved a radical transformation from commodities to medium- and high-technology manufactured products, thanks to special import regimes and export-oriented manufacturing. In contrast, in the Caribbean, the rest of MERCOSUR, the Andean countries (especially Ecuador and the Bolivarian Republic of Venezuela) and Chile, the technological content of their exports has stagnated. This is largely explained by the boom in the prices of commodities exported by these countries, which has increased the weight of such goods in the export basket. Between these two extremes are Argentina and Brazil, whose commodity exports have declined relatively, while medium-technology products have gained a larger share.

As shown in figure II.20, between the 1970s and the decade of 2000, the Latin American and Caribbean export structure has varied from natural resources to manufactured products of medium and high technological content. This change has been even more pronounced in East Asia, however. Except for Mexico, and to a lesser extent Central America and Brazil, exports from the other Latin American and Caribbean countries remain concentrated in natural resources and related manufactures. In fact, apart from Mexico, such goods account for over 50% of the total volume exported by the region's countries. These product categories not only tend to incorporate less technology than manufactured goods, but, until recently, were the least dynamic segments of world trade and are the least integrated into global production networks.

The Latin American countries that have succeeded in diversifying their exports to include medium- and high-technology goods have not enjoyed faster economic growth.[38] The likely explanation for this is that they have not increased the value-added of these goods to the same extent (see the analysis of section B), which means that these activities have not become sufficiently integrated into the domestic economy. As production processes are increasingly distributed across different parts of the world, a developing country that exports a high-technology product may

[37] Several characteristics of production processes, such as their environmental impact, have also become steadily more important in determining the cost of products.

[38] In addition, the Latin American countries that grew most over the last decade were not always those whose export structure changed in this direction (Machinea and Vera, 2006).

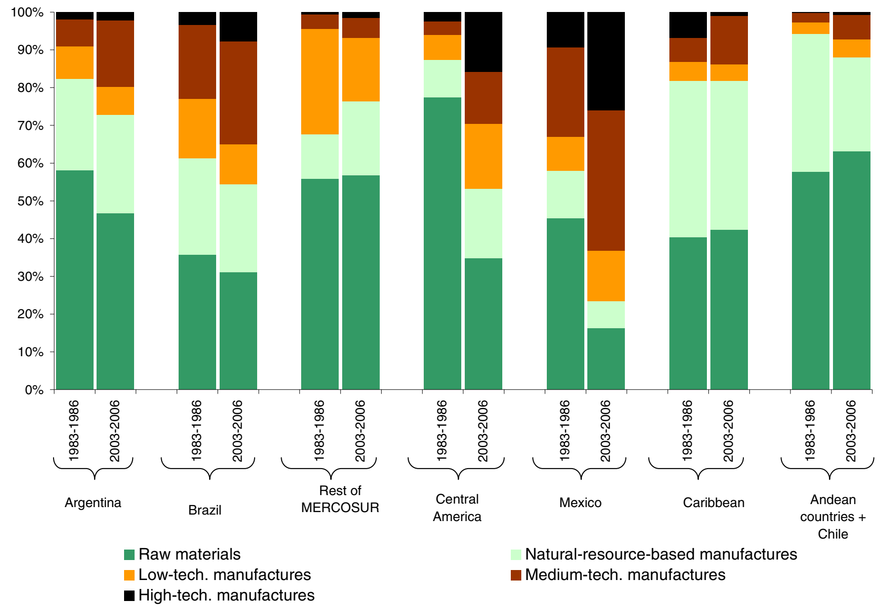
simply be the final link in the production chain, without having the knowledge needed to produce the good itself (UNCTAD, 2002; ECLAC, 2004b).

Figure II.20

COMPOSITION OF EXPORTS BY TECHNOLOGICAL CONTENT, 1980-2000

(Percentages of the total)

(a) Countries and subregions of Latin America and the Caribbean



(b) Regions of the world

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of United Nations Commodity Trade Database (COMTRADE).

Note: Data for the period 1983-1986 correspond to the Standard International Trade Classification (SITC), Rev. 1.

Accordingly, a classification of export products by technological intensity should be complemented with a measure to distinguish between countries that export high-technology goods as the final links in vertically fragmented chains, and countries that export such goods in less fragmented chains and therefore possess the knowledge needed to produce the whole good. One way to consider this issue is to note that, in the first case, the final stages of the production process are generally located in medium and low per-capita-income countries, for cost-advantage reasons. In the second case, production processes are located (completely) in high-income countries, for reasons associated with local technological capacities.

For each exported product, Lall, Weiss and Zhang (2005) propose calculating an indicator of the weighted average income of the countries that export it. Thus, high-technology goods whose production processes are fragmented and whose final stages are located in low-income countries will obtain a low value for this indicator, whereas high-technology goods processed entirely in high-income countries will obtain a high value. Box II.5 explains the methodology in greater detail, and comments on results for a number of countries. Although it is only an approximation, this measure of export "sophistication" sheds light on the varied performance in terms of innovation effort, research and development, productivity and growth of the main exporters of high-technology goods, e.g. the United States and Israel, compared to Mexico and China.

A complementary way of studying exports is via the specialization produced in terms of vertical quality scales for a given product. This analysis reflects the fact that a country's relative factor endowment not only affects specialization by product type, whether natural resources or manufactured products of varying technological content, but it also influences certain quality segments within the same category. Considering the importance of the innovation component in product quality, this topic is reviewed in chapter III, section D.

Box II.5

EXPORT SOPHISTICATION

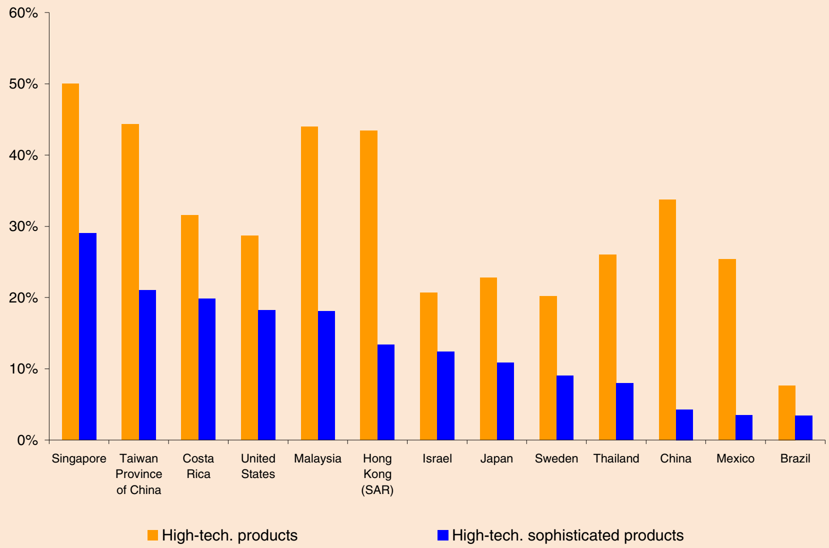
Export sophistication can be measured using a methodology proposed by Lall, Weiss and Zhang (2005), which is described in four steps. Firstly, all countries of the world are ranked by their level of per capita income in PPP terms for 2006, and they are then put into 10 groups of equal number. Secondly, for each export category (defined by SITC Rev 2 at the three-digit level, 237 categories in all), the weighted average income of countries that export the product in question is calculated, by multiplying the average income of each group by each group's global share of exports of that product. Thirdly, the values obtained for the 237 categories are ranked and normalized to construct a "sophistication" index between 0 and 100, with 0 corresponding to the lowest value and 100 to the highest. Fourthly, three sophistication segments are constructed with this index: high, medium and low, each segment containing one third of the 237 categories. As a result, the high sophistication segment consists of categories mostly exported by higher-income countries, the middle sophistication category is exported by middle-income countries, and segments of low sophistication tend to be exported by low-income countries.

This classification of product lines by sophistication segment is used to calculate the percentage of a country's high technology exports that are also in the high sophistication category. For example, one third and one quarter of exports from China and Mexico, respectively, are high-technology products; yet only a small proportion of them are considered sophisticated. In fact no more than 4% and 3% of Chinese and Mexican exports, respectively, are both high-technology and sophisticated products. In the case of China, high-technology exports are concentrated in computers and other data processing equipment. In Mexico, the main product among its high-technology exports is "TV receivers", for which the production process is often vertically fragmented. These items are usually exported from middle- or low-income countries. In Brazil, in contrast, high-technology exports account for just 8% of the total, but almost half of them are in the high sophistication segment. The main product lines in this case are aircraft, related equipment and spare parts. These products, as claimed by Lall, Weiss and Zhang (2005), generally have a less fragmentable production process and so tend to be exported mostly from high-income countries. In fact, the percentage of sophisticated high-technology products is almost the same in Brazil as in Mexico. Costa Rica is the country in the region with the highest proportion (1/5) of such sophisticated products, as an exporter of transistors and semiconductors —product lines that are mainly exported from high-income countries.

Box II.5 (concluded)

HIGH-TECHNOLOGY PRODUCTS AND SOPHISTICATED HIGH-TECHNOLOGY PRODUCTS, 2006

(Percentages of total exports)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of United Nations Commodity Trade Database (COMTRADE)

(b) Services

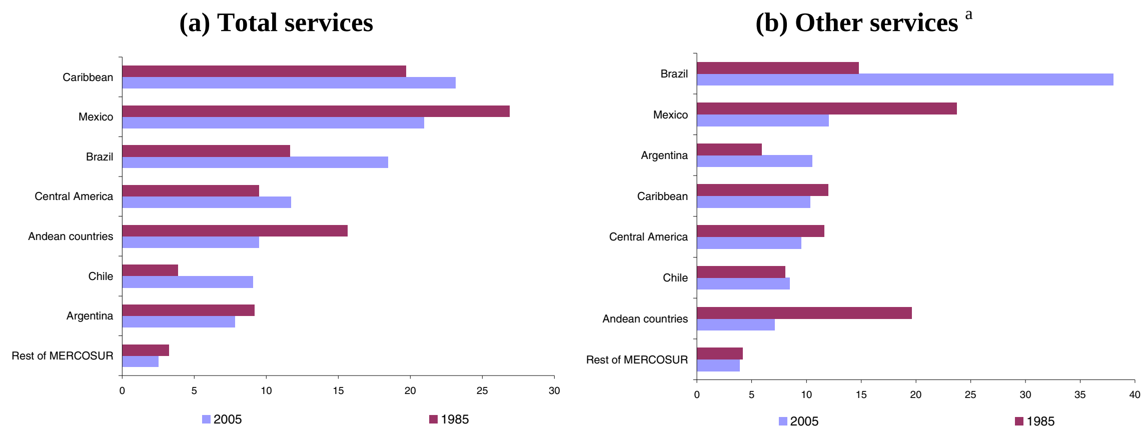
The level of technology and knowledge incorporated into services varies significantly. Depending on the content of these two elements, services can be classified as either “traditional”, which include transport and travel, especially tourism; or “modern”, or more knowledge- and technology-intensive services, such as information technology, engineering, research and development and telecommunications. The latter category has been the fastest growing service segment since 1995, the first year for which relatively more complete data on this type of trade exist.

An analysis of trends over the last two decades shows that between 1985 and 2005, the Latin American and Caribbean share of world trade in modern services shrank from 2.1% to 1.8%, in contrast to the progress made by other emerging countries, particularly China and India. The result, however, conceals major heterogeneity between the different subsectors (ECLAC, 2007a).[39]

The regional average conceals great variety in terms of position and dynamism across subregions and countries between 1985 and 2005 (see figure II.21). The countries in which total exports increased most were Brazil and Chile, the latter largely due to the vigorous expansion of transport services, a sector in which it is currently the regional leader. Meanwhile, in the same period, Brazil, Argentina, Honduras and Costa Rica recorded the highest growth rates in modern services. Intraregional heterogeneity to some extent affected the country and subregional shares in the total trade in services. In the case of Brazil, its share of Latin American exports of this type of services increased from 15% to 38%, while the Andean Community and Mexico posted the steepest fall in this segment. On the other hand, the latter succeeded in maintaining its position as the region’s leading exporter of services, thanks to tourism.

39 The Latin American and Caribbean share has declined sharply, especially in global trade in communications and insurance. The only category in which the region's share partly increased was “Other business services”.

Figure II.21
EXPORTS OF SERVICES FROM LATIN AMERICA AND THE CARIBBEAN: COUNTRY AND SUBREGIONAL SHARES, 1985 AND 2005



Source: International Monetary Fund (IMF), "Balance of Payments Statistics (BOP) database" [on line] http://www.imfstatistics.org/bop/.

[a] The "Other services" category encompasses all services apart from transport and travel.

In the case of "modern" services, the fastest-growing subcategories in Brazil over the last few years have been professional services and the execution of technical projects —activities that are mostly related to engineering and architecture, account for a third of all services exported and constitute one of the country's main comparative advantages. In addition, Brazil, Argentina, Costa Rica and Uruguay rapidly increased their exports of computer programs; and, over the last few years, several computer manufacturers have successfully morphed into software-related service providers, such as IBM in Argentina (ECLAC, 2007a) (see chapter V).

D. Other technological externalities associated with integration in the global economy

As mentioned in chapter I, section B, and discussed further in chapter III, the innovation process in the developing countries consists to a large extent in adopting and adapting goods and technologies, including organizational and marketing methods and logistics used in the developed world. In this context, trade and foreign investment emerge as mechanisms that can be used to speed up technological progress.

International trade helps developing countries exploit advanced-country technologies, both by directly acquiring intermediate and capital goods and by purchasing licences. They can also learn from exports to advanced countries, by interacting with customers who generally demand better product quality.

Another way of acquiring technologies is through FDI. Nonetheless, to successfully absorb the technologies embedded in the capital goods, intermediate inputs or production processes related to FDI, the country or sector in question needs to satisfy certain requirements in terms of worker training, innovation and an environment that stimulates learning, supported by a regulatory framework that promotes technology transfer. Fulfilment of these conditions is not automatic and requires private initiatives and coordinated public policies (see chapter VI).

1. Trade-related externalities

There are three channels whereby technology can be transferred through trade: learning through imports, learning through exports and learning by doing. Apart from these aspects, this chapter also considers participation in world value chains as a mechanism to facilitate the different types of learning.

The first channel is *learning by importing*, whereby local producers obtain an international stock of knowledge that enables them to increase their productivity. This channel has been very important in the rapid growth of the Asian countries, which, by importing and imitating the high-technology goods of advanced countries (i.e. “reverse engineering”), became leaders of the technological segment. This achievement was only possible thanks to a set of complementary policies that promoted innovation, gross capital formation and investment in human capital.

The second channel is *learning by exporting*, which allows exporters to internalize the standards and requirements of their buyers and foreign competitors. Competition is an incentive for exporters to move towards the knowledge frontier as quickly as possible. Foreign customers can also facilitate the dissemination of technologies to their suppliers. Empirical studies show conclusively that the export sector has a higher level of productivity, although the effects of this on growth are not clear, nor are the causes. At the enterprise level, there is some evidence that TFP is higher after firms start to export. Fernándes and Isgut (2005) have documented this type of learning among Colombian firms, particularly in new plants that export to advanced countries. De Negri and Oliveira de Araujo (2007) have studied the close relation between the weight of exports and labour productivity in Brazil.[40] Other studies have shown that productivity is higher when firms also invest in research and development (see chapter III).

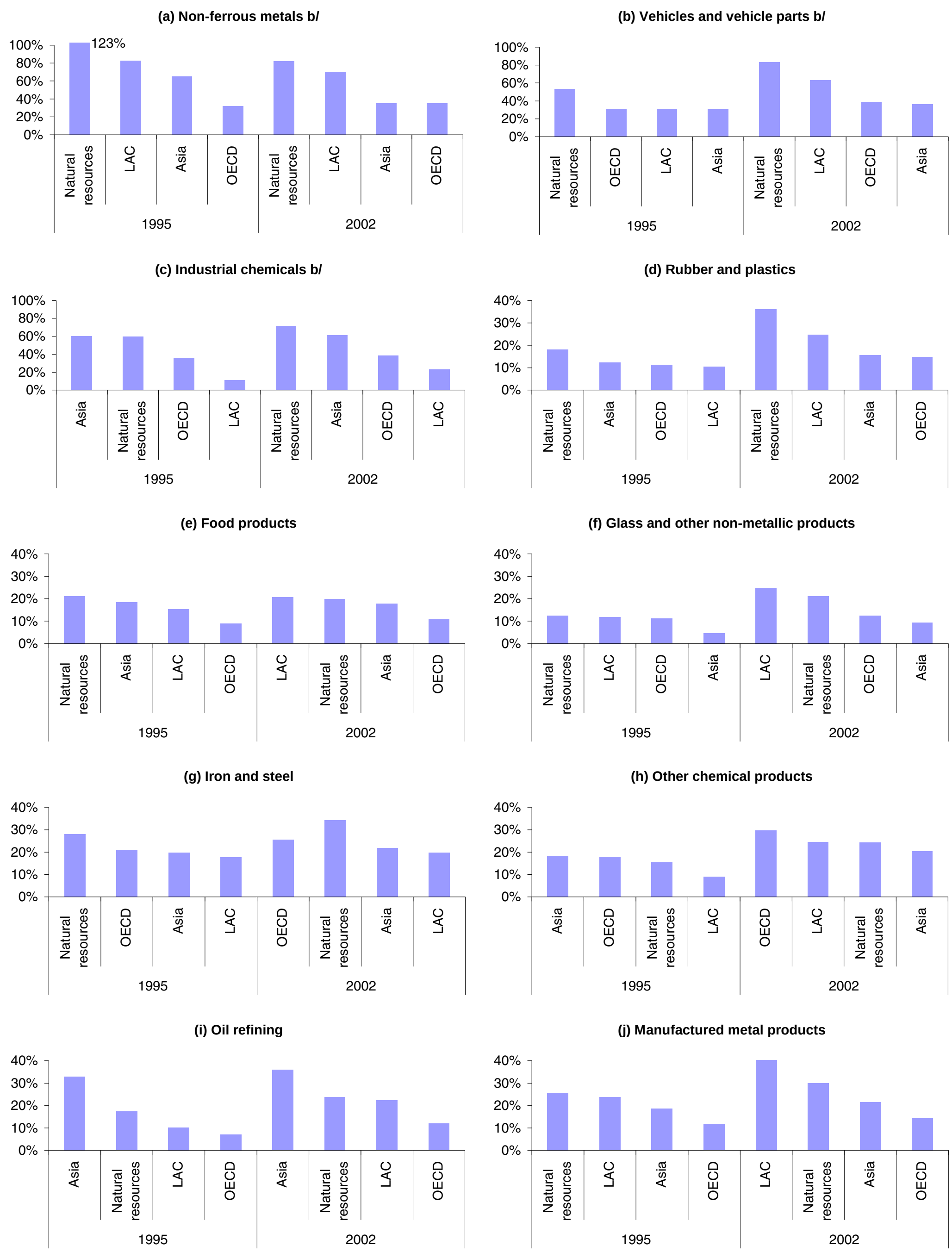
A third channel is *learning by doing*, which highlights the role of experience in raising productivity levels. Import substitution policies stressed this channel (Hounie and others, 1999; Katz, 1987), as firms moved through technological learning processes “building” their production functions and systems of work organization along the way. Enterprises did not content themselves merely with using and copying available technologies, but adapted them to local plants on a smaller scale than those in developed countries and to different work organization models. The trial and error method and internal adaptive engineering efforts were key features of the production organization model in the endogenously directed stage of Latin America’s economic development.

Nonetheless, rapid trade liberalization and the deregulation of production activities in Latin America and the Caribbean partly destroyed the economy’s production and technological capacity, although at the same time new capacities were created, particularly in export sectors. Because of external openness, the product design and process engineering departments of numerous firms targeting the domestic market ceased to fulfil a purpose and were drastically cut. Something similar happened with the development of local suppliers when external supply became cheaper. As a counterpart, during the 1990s new export sectors pioneered a reverse evolutionary process involving the “creation” of new capacities and institutions (see Katz, 2008).

The likelihood of learning is greater in industries subject to economies of scale in a setting of growing exports and increasing specialization. The benefits of specialization and scale economies can be complemented through technological learning externalities. In most of the industries in which scale economies are intensively applied, in 2002 the Latin American and Caribbean region was ranked either first (food, glass and other non-metallic products, and metallic products) or second (non-ferrous metals, vehicles and vehicle parts, rubber and plastics, and other chemical products), in terms of exploiting exports to increase production volume (see figure II.22).

[40] Based on a survey of industries with over 30 workers in 2000, these authors distinguished four groups of enterprises: (i) those of major export intensity (with an export/sales ratio of 0.24); (ii) exporters (0.16); (iii) firms with export potential (0.00); and (iv) firms targeting the domestic market (0.00). Labour productivity in group (i) was 2.3 times higher than in groups (ii) and (iii); and the results of the latter were double those of group (iv). Chapter III contains an analysis of new surveys on innovation in several Latin American and Caribbean countries.

Figure II.22
RATIO BETWEEN EXPORTS AND PRODUCTION IN ECONOMIES OF SCALE INDUSTRIES, 1995 AND 2002 [a]
(Percentages)



Source: World Bank, The World Bank Trade and Production database.

[a] Industries subject to increasing returns were defined by Pavitt (1984) and Peneder (1999).
[b] The vertical scales in these figures range from 0% to 100%.
[c] LAC = All Latin American and Caribbean countries; Asia = Malaysia, Philippines, Republic of Korea, Singapore, Thailand and Vietnam; OECD = Countries of the Organisation for Economic Co-operation and Development; Natural resources = Australia, Canada and New Zealand.

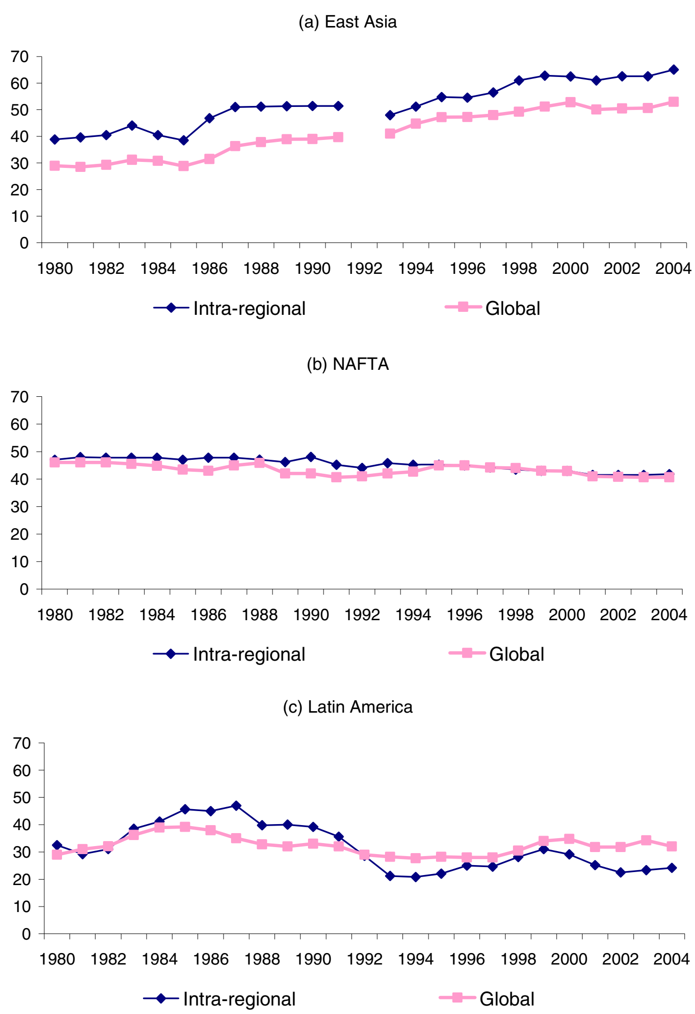
Compared to Latin America, trade patterns in Asian countries display greater vertical specialization and more intensive participation in international production networks (ECLAC, 2007a) (see chapter I), most of which are located in their own region. Labour-intensive processes are concentrated in Thailand and China, whereas the manufacture of engineering-intensive components has been maintained in Japan and the Republic of Korea. Firms from the United States and Europe are also entering production chains in the Asian region; but, Mexico and Central America apart, Latin America and the Caribbean does not participate much in global manufacturing chains.

A review of the proportion of machine parts and components in the sector's global and intraregional exports and imports affords a partial view of the different countries' participation in regional and global production networks. As shown in figure II.23, unlike what happened in the countries of the North American Free Trade Agreement (NAFTA) and Latin America, the East Asian countries have considerably increased their exports and imports of machine parts and components.

Figure II.23

TRADE IN MACHINE COMPONENTS AND PARTS AS A PERCENTAGE OF THE SECTOR'S TOTAL TRADE, 1980-2004

(Percentages)

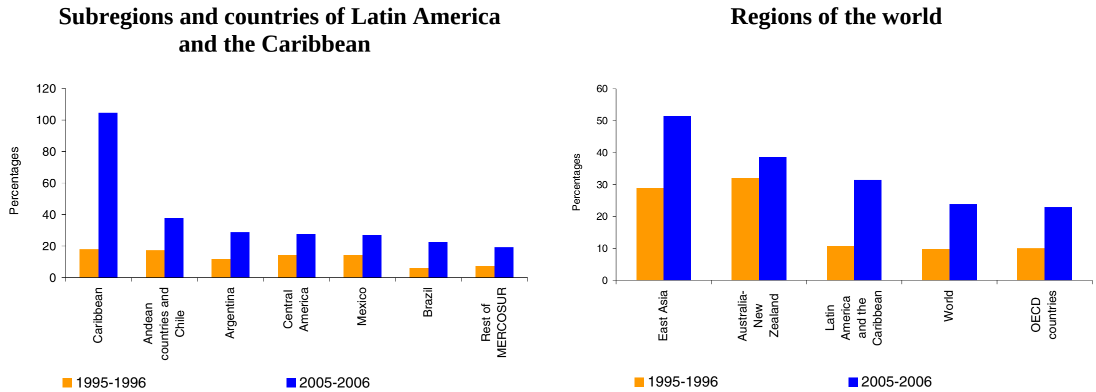


Source: M. Ando, S.W. Arndt and F. Kimura, "Production networks in East Asia: strategic behaviour by Japanese and U.S. firms", paper presented at the seminar "Multinational Firms' Strategies in East Asia: A Comparison of Japanese, U.S., European and Korean Firms", Tokyo, Japan Center for Economic Research, 1 June 2006.

2. Externalities related to foreign direct investment

Latin America and the Caribbean received a substantial increase in FDI inflows over the last decade (in absolute value terms), tripling the cumulative stock in relation to GDP (see figure II.24). The Caribbean and the Andean subregion (including Chile) received the highest amount of FDI as a proportion of GDP.[41] In other parts of the world, the strongest FDI growth in the period 1995-2006 occurred in East Asia.

Figure II.24
CUMULATIVE FOREIGN DIRECT INVESTMENT AS A PERCENTAGE OF GDP, 1995-2006



Source: United Nations Conference on Trade and Development (UNCTAD), Foreign Direct Investment database, November 2007.

Note: The figures do not include the following financial havens: the Cayman Islands and the British Virgin Islands.

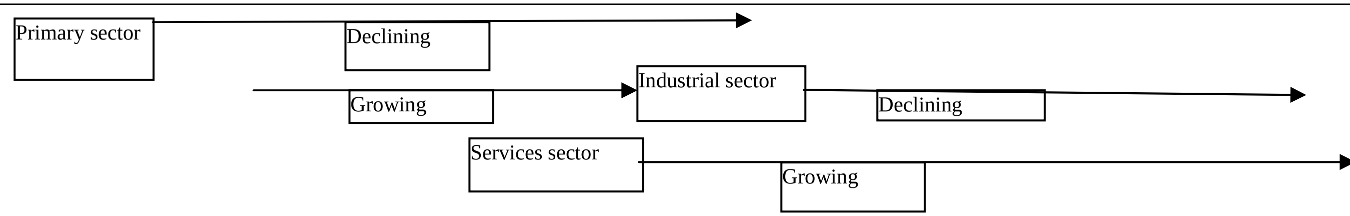
Despite the large volume of FDI, technology and knowledge transfer to local firms does not occur spontaneously but depends on the following factors: (i) the strategy of the investing enterprise; (ii) each country's absorption capacity; (iii) the absorption capacity of the sector and firm in question; and (iv) the type of investment (ECLAC, 2003).

The first two factors relate to the development level of the country receiving the FDI. Here it is possible to distinguish four stages that are equivalent to the different phases of domestic knowledge accumulation and potential for technological spillovers (see table II.3). The first of these is the pre-convergence stage, encompassing countries of lowest per capita income and little technological capacity. FDI inflows are relatively small and they are motivated by the search for raw materials. Externalities are few, because the investments are focused on a single activity in an enclave setting.

The second evolutionary phase corresponds to countries that are converging towards a higher level of economic development, but whose knowledge-absorption capacity is insufficient. These countries have a critical mass of physical, financial and institutional infrastructure but often lack skilled labour and a clear innovation effort. At this stage, which encompasses most of the region's countries (Argentina, Brazil, Chile, Colombia, Costa Rica and Mexico, among others), investors seek not only natural resources but also access to cheap labour (efficiency-seeking) and participation in a local market of greater purchasing power. This type of investment generally has relatively weak technological externalities and linkages.

[41] Among the Andean countries, Chile has the largest volume of FDI in relation to GDP (55% in 2006 according to UNCTAD data).

Table II.3
THE ECONOMIC DEVELOPMENT PROCESS AND FDI STRATEGIES

	Pre-convergence stage	**Convergence stage**	**Stage prior to shared frontier**	**Shared frontier stage**
Technological and absorption capacities	Exports of natural- resource-based products. Low technological capacity, scant infrastructure and underdeveloped institutions. Few local firms with adequate technological capacity. Low levels of inward FDI and no FDI outflows.	Exports of final products of low value-added, made with imported components or inputs (maquila). Increasing capacity to imitate. Basic infrastructure. Growing FDI inflows, but little FDI abroad	Integration in global production networks. Growing knowledge infrastructure. Solid domestic industry, development of own brands. Increasing use of networks. Significant FDI inflows and large outflow of FDI abroad	Technological opportunities depend on long-term collaboration. Removal of knowledge barriers. Major R&D activity (in networks) by domestic and transnational firms. Increasing FDI inflow and outflow abroad, including outsourcing in countries which are at earlier stages
Economic structure				
FDI strategy	Pursuit of raw materials	Pursuit of raw materials and efficiency related to the presence of unskilled workers and infrastructure. Increasing pursuit of markets.	Pursuit of markets and also increasing pursuit of efficiency based on skilled labour.	Pursuit of efficiency, markets, and technological assets.
Examples	Bolivia, Paraguay and Vietnam	Pursuit of markets *Automotive*: MERCOSUR; *Food and beverages:* Argentina, Brazil, Mexico; *Banking*: Argentina, Brazil, Chile, Colombia, Mexico, Peru, Venezuela (Bol. Rep.) *Telecom*: Argentina, Brazil, Chile, Peru, Venezuela (Bol. Rep.); *Retail trade*: Argentina, Brazil, Chile, Mexico; *Electricity*: Argentina, Brazil, Chile, Colombia, Central America. Pursuit of efficiency: *Automotive*: Mexico; *Electronics*: Mexico and the Caribbean basin; *Apparel*: Caribbean basin and Mexico, Central America.	Republic of Korea, Spain, Czech Republic.	Australia, Canada, Finland, Ireland, New Zealand, Singapore, Sweden.

Source: R. Narula, "Switching from import substitution to the "New Economic Model" in Latin America: A case of not learning from Asia", *Research Memorandum Series*, Nº 2002-32, MERIT-Infonomics, Maastricht, 2002; and Economic Commission for Latin America and the Caribbean (ECLAC), *Foreign Investment in Latin America and the Caribbean, 2003* (LC/G.2226-P), Santiago, Chile, May 2004. United Nations publication, Sales No. E.04.II.G.54.

Countries in the third stage are increasingly integrated in global production networks and have increasing knowledge infrastructure with a high potential for technological spillovers. Apart from Singapore and the Republic of Korea, the East Asian countries are in this phase; but no Latin American or Caribbean country has yet attained this stage of development. Countries going through phases 1-3 do not make much use in the local economy of externalities produced by transnational enterprises, since the latter's research and development activities mainly take place in their countries of origin.[42]

Countries that are in the final development stage, in which FDI recipients share the technological frontier with foreign firms, have attained a high level of per capita GDP. Their economies are very R&D-intensive and they have highly skilled labour. In this case, FDI largely entails the pursuit of technological assets, i.e. investors take advantage of the local system for their R&D activities.

The third determinant of the technology-transfer effects of FDI is the capacity of the different sectors and enterprises to internalize knowledge created by others and adapt it to their own needs (Narula and Marin, 2005). Several studies show that externalities are greater when the technological gap between the transnational firm and local enterprises in the given product line is not very large. Nonetheless, the ability to absorb not only entails imitating or copying technology, but also undertaking one's own research and development. Hence the key factor in absorption capacity is the availability of skilled labour.

The fourth factor affecting technology transfer is the type of investment. Several studies have shown that there are more chances of spillovers in the case of mixed domestic/foreign-owned enterprises (Nordas, Miroudot and Kowalski, 2006).

Empirical studies on the importance of externalities in Latin America and the Caribbean, which are very recent, conclude that the effects of FDI have only been positive in some cases.[43] In a complete review of studies on the spillover effects of FDI, ECLAC (2003) concluded that the repercussions have very often been neutral and sometimes negative; and that, in the best of cases, the link is uncertain, especially in the case of developing countries. Several recent studies confirm that positive externalities are only occasionally present, whereas in other contexts the outcome is unknown or has been negative (see table II.4).

In short, despite the large volume of FDI in Latin America and the Caribbean, externalities are generally limited. This is explained by the predominant corporate strategies, which do not favour technology transfer, and also by the lack of local innovation and human capital capacity, and because the investments in question are not mixed or shared with local enterprises.

A recent FDI-related development in the region is the increasing importance of transnational enterprises of Latin American origin, known as "trans-Latin" firms (see box II .6), whose investments have strengthened international integration among local enterprises. Their international activities also have positive repercussions, including direct effects on enterprise growth based on the exploitation of scale economies, greater investment capacity which is applied also to local operations, and better management capacity thanks to exposure to global levels of competition and best practices.[44]

[42] Just 12% of R&D activities undertaken by transnational firms from OECD countries take place outside the country of origin. Moreover, in the recently industrializing countries only a small proportion of private research and development corresponds to transnational firms (Amsden, Tschang and Goto, 2001). This reality is often explained by the lack of a suitable local base for this purpose.

[43] The results contrast with the traditional view of the effects of FDI, which were assumed to be automatic and highly favourable for the receiving countries.

[44] See Economic Commission for Latin America and the Caribbean (ECLAC), *Foreign Investment in Latin America and the Caribbean*, Santiago, Chile, various years.

Table II.4
SUMMARY OF STUDIES ON THE TECHNOLOGICAL SPILLOVERS OF FDI IN LATIN AMERICA AND THE CARIBBEAN AND IN OTHER REGIONS

Author and year	Country	Period	Data	Level	Results
		(a) Latin America and the Caribbean			
Narula and Marin (2005)	Argentina	1992-1996	Cross section	Firm	? (6)
Chudnovsky, Lopez and Rossi (2006)	Argentina	1992-2001	Panel	Firm	? (1)
Laplane, Padovani Gonçalves and Dias de Araújo (2006)	Brazil	1997-2000	Panel	Sector	? (2)
				Firm	?, + and – (3)
Ramirez (2006)	Chile	1960-2000	Co-integration	Macro series	+
Kugler (2001)	Colombia	1974-1998	Panel	Industry	?
Blomstrom and Wolf (1994)	Mexico	1970-1975	Cross section	Industry	+
Kokko (1996)	Mexico	1970	Cross section	Industry	+
Romo (2003)	Mexico	1992-1995	Panel	Industry	- and ?
Jordaan (2005)	Mexico	1993	Cross section	Sector	+
Waldkirch (2007)	Mexico	1998 and 2003	Cross section	Sector	+
Kokko and others (1996)	Uruguay	1990	Cross section	Firm	?
Kokko and others (2001)	Uruguay	1988	Cross section	Firm	?
Bittencourt and Domingo (2006)	Uruguay	1990-2000	Panel	Sector	? (4)
		1990-1996 and 1997-2000	Panel	Firm	- and ? (5)
Aitken and Harrison	Venezuela (Bol. Rep. of)	1976-1989	Panel	Firm	-
		(b) Countries in the reference group			
Caves (1974)	Australia	1966	Cross section	Industry	+
Globerman (1979)	Canada	1972	Cross section	Industry	+
Kearns (2000)	Ireland	1984-1998	Panel	Firm	+
Barry and others (2001)	Ireland	1990-1998	Panel	Firm	-
Barrios and others (2002)	Ireland	1992-1997	Panel	Firm	?
Ruane and Ugur (2002)	Ireland	1991-1998	Panel	Firm	+
Barrios and others (2002)	Spain	1992-1997	Panel	Firm	?
Barrios and Strobl (2002)	Spain	1990-1998	Panel	Firm	?
Castellani and Zanfei (2001)	Spain	1993-1997	Panel	Firm	-
Djankov and Hoekman (2000)	Czech Republic	1992-1996	Panel	Firm	-
Kinoshita (2001)	Czech Republic	1995-1998	Panel	Firm	?
Damijan and others (2003)	Czech Republic	1994-1998	Panel	Firm	-
Damijan and others (2003)	Czech Republic	1995-1999	Panel	Firm	?
Torlak (2004)	Czech Republic	1993-1999	Panel	Firm	-
Karpaty and Lundberg (2004)	Sweden	1990-2000	Panel	Firm	+
Thanh Thuy (2005)	Vietnam	1995-2002	Panel	Industry	+ and ?

Source: Economic Commission for Latin America and the Caribbean (ECLAC), *Foreign Investment in Latin America and the Caribbean 2003*, (LC/G.2226-P), Santiago, Chile, May 2004. United Nations publication, Sales No. E.04.II.G.54 (updated with empirical studies between 2004 and 2007).

(1) Local firms with high absorption capacity seem to receive positive spillovers.
(2) The evidence on spillovers was inconclusive. The effects are apparently negative, but not significant.
(3) The results suggest a positive spillover depending on the response capacity of the domestic firms. The effects are positive for firms with larger productivity gaps with respect to transnational enterprises. For the most efficient firms (with the smallest productivity gaps) the effects are negative, which suggests that in this case consequences of other types predominate, making the net effect negative. One possible interpretation is the loss of market share.
(4) There is no evidence of spillovers in panels covering the whole period, which could be the result of positive spillovers in the first half of the decade and negative ones in the second.
(5) In some models/periods, there is evidence of negative spillovers, but in others the evidence is inconclusive.
(6) In reality, these refer to the higher value added of local firms.

Box II.6
TRANS-LATIN ENTERPRISES

Although trans-Latin enterprises are not a recent phenomenon, they have become increasingly important over the last few years. The leading firms of this type come from four Latin American countries: Argentina, Brazil, Chile and Mexico. Argentina and Brazil were the pioneers, leading the first waves of direct investment abroad, while Mexico and Chile joined the process later and have recently become major players.

The activities of trans-Latin enterprises are concentrated in three sectors: basic industries (hydrocarbons, extractive mining, iron and steel, cement, metal processing, and paper and pulp); beverages and foods; and services (engineering, telecommunications, electric power, retail trade, and most recently banking). These firms' investments depend on the competition patterns prevailing in their respective sectors, and include the need to maintain a position of leadership in the natural-resource sector and the chance to exploit competitive advantages in new markets.

Many of the traditional trans-Latin firms undertake manufacturing activities targeting mass markets, such as non-alcoholic beverages, beer and food products. They operate more in the regional domain than internationally, competing with transnational enterprises in their own domestic or regional markets, in which their main competitive advantage is the distribution system.

Many of the more modern trans-Latin enterprises have operated in the services area: e.g. telecommunications (América Móvil, Telmex); the retail trade (Elektra, Cencosud, Falabella, Ripley, FASA); passenger air transport (LAN, Varig, TAM); and electricity (Enersis, Gener, ISA). In general, these firms have encountered stiff competition from foreign enterprises. Thus, although some successful trans-Latin firms have benefited from the sale of assets belonging to transnational firms whose expectations on entering the Latin American market were not fulfilled (América Móvil, Cencosud, Falabella), in other cases they have had to sell part or all of their assets (Enersis, Gener, Macri, Impsat).

Although much of the outgoing FDI in Latin America has been of an intraregional nature, in recent years trans-Latin firms have started to participate more actively in the internationalization process outside the region. In the last two years, the main promoters of these external investments have been a relatively small group of trans-Latin firms from Brazil and Mexico. The Brazilian group consists of Companhia Vale do Rio Doce (CVRD), which took over the Canadian firm INCO, and Petrobras, Gerdau and Itaú, which have engaged in a wide range of independent operations. The Mexican group consists of América Móvil and Telmex, firms that have made large-scale takeovers in Latin America and the Caribbean; the Alfa group, which grew in the United States, Europe and China; and Cementos Mexicanos (CEMEX), which acquired the Australian Rinker group. Apart from the Brazilian and Mexican trans-Latin enterprises, large-scale investments have also been made by Tenaris of Argentina, which purchased the United States firm Maverick Tube Corp.; and the oil company of the Bolivarian Republic of Venezuela (PDVSA), which is investing in refineries (Argentina, Belize, Brazil, Uruguay) and gas pipelines (Colombia).

Source: Economic Commission for Latin America and the Caribbean (ECLAC), *Foreign Investment in Latin America and the Caribbean*, Santiago, Chile, various years.

Chapter III

Innovation and economic development

Innovation makes it possible to create new learning patterns and markets, and there is consequently a close relationship between lengthy growth cycles and the emergence of a series of linked innovations, with considerable spillover effects and interconnections between sectors. Countries' potential to drive development depends mainly on their capacity to participate in this type of cycle and use the opportunities offered by structural change to ensure that sectors and businesses incorporate innovative processes and products (see chapter I).

The main driving force for innovation comes from the interaction between research and development (R&D) activities (both public and private) and the capacity of firms to generate, adopt and disseminate innovative processes and products (Freeman and Pérez, 1998; Freeman, Clark and Soete, 1982). Public R&D activities lay the foundation for science to contribute and relate to production activities. Corporate R&D laboratories are geared towards innovations that will give them new competitive advantages. Innovations are often the outcome of systematic efforts undertaken by such laboratories, which have considerable financial and technological resources at their disposal. The systemic aspect of the emergence and dissemination of such innovations reinforces the externalities related to the interaction with public and private research centres (see chapter VI).

However, the advantages afforded by these innovations are transitory, since they fade away as an array of imitators spring up to diffuse the new knowledge, which increases the productivity and well-being of the economy as a whole and spreads the benefits of innovation to other agents and countries. In order for this to occur, countries seeking to close the gap between themselves and the technological frontier must engage in a sustained learning process (Fransman and King, 1984). Market share and often the very survival of companies depend on their ability to innovate, i.e., to adapt and improve the quality of their processes and products.

Although incremental innovations reflect small and apparently insignificant changes, over time they can accumulate and come to have major effects on productivity and international competitiveness. Such innovations are often not devised in formal R&D departments and are not registered as patents but are instead associated with practical learning and problem-solving that form part of the production process. This type of innovation plays a particularly important role in developing economies, where imported technology is diffused in specific economic and social environments where it must be adapted, adjusted and improved. Thus the process of diffusion merges with the gradual generation of innovation, the intensity of which depends on the extent of the efforts expended locally.

There is a close link between the diffusion of innovation and efforts to adopt, adapt and subsequently create new technologies in developing countries. Since the early 1980s, studies have placed special emphasis on the microeconomics of technical change (Fransman and King, 1984; Bell and Pavitt, 1994; Cimoli, 2005; Cimoli and Dosi, 1995, Maloney and Perry, 2005; Dosi, 1988; ECLAC, 2007e). Learning in developing economies has been shown to consist in increasing the adoption and adaptation of innovations in all activities related to production processes, product quality and design and commercialization strategies. This develops countries' technological capabilities and generates competitive advantages that redefine the export potential of businesses and the international position of each economy. In addition, as shown in chapter I, section B, the importance of adoption and adaptation in the learning processes of developing economies becomes clear when levels of income are taken into account (Klinger and Lederman, 2006).[1] Cutting-edge technological innovations begin to be generated once a certain threshold (US$ 7,000 in purchasing power parity (PPP) of 1995) has been reached, but this threshold is above the per capita income of most of the region's countries. However, a number of countries do have higher incomes, and the R&D lag that exists in these cases is a particular cause for concern.[2]

Any assessment of such technological efforts must involve an analysis of microeconomic variables at the level of firms and products. Innovation surveys are used to measure the innovative behaviour of firms, and analyses of price differentiation in international trade gauge the effort made to increase product quality. In developing countries, improving quality reflects the adoption and adaptation of more efficient processes or techniques, be it in the form of quality certificates or standards, organization improvements, labour skills or commercialization strategies. The analysis of such microdata is supplemented by case studies that show the learning trajectories experienced in various sectors (see chapter V).

This chapter is organized in the following way. The first section provides an analysis of the R&D efforts of the region's countries and their effectiveness. Given that the indicators available for this area do not offer an overall view of the determinants of innovation in businesses and industry sectors (especially in Latin America), section B supplements the analysis with information from national innovation surveys carried out in several countries of Latin America and the Caribbean. Section C examines how adoption and adaptation efforts lead to the incorporation of quality into export products, with special emphasis on the agri-food sector.

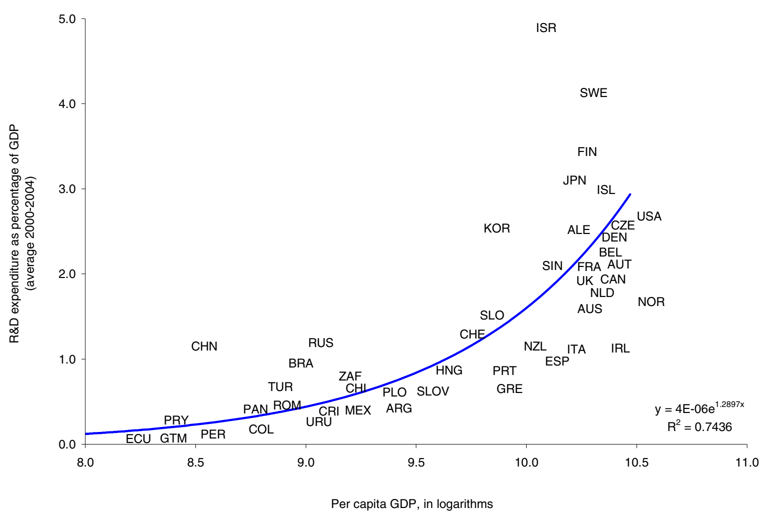
1 There is nonetheless considerable variation in terms of this trend (Maloney and Perry, 2005).
2 This is the case of Antigua and Barbuda, Argentina, Brazil, Chile, Costa Rica, Mexico and Uruguay.

A. The scientific and technological capacity of the region's countries

One of the first indicators used to measure innovation efforts at the aggregate level is spending on R&D, both in absolute terms and as a percentage of GDP.[3] As described in chapter I, world investment in R&D has grown steadily, rising by more than 40% between 1990 and 2003. The increase has been spearheaded by the United States (36%), Germany (16%) and Japan (14%), with the proportion represented by China growing to over 8% of total world R&D spending. At the same time, other Asian economies such as India, the Republic of Korea and Taiwan Province of China are also coming to the fore, with the share of the former countries decreasing as a result. The contribution of Latin America has remained steady at 2.6% since the 1990s. As stated in chapter II, these trends reflect the fact that the countries spending the most on R&D are the ones with a production structure that is more specialized in technology- and knowledge-intensive sectors.

Several studies show a virtuous circle in which R&D spending, innovation, productivity and per capita income mutually reinforce each other (Cimoli, 2005; ECLAC, 2007e and Science and Technology for Development, no date). Figure III.1 shows that, comparatively speaking, investment in R&D in Latin American countries (except in Brazil) is lower than expected given their level of per capita income.

Figure III.1
SELECTED COUNTRIES: INNOVATION EFFORTS AND PER CAPITA INCOME



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of information from the United Nations Educational, Scientific and Cultural Organization (UNESCO); Organisation for Economic Co-operation and Development (OECD), *Main Science and Technology Indicators*, Paris, 2007; Ibero-American Network of Science and Technology Indicators (RICYT); World Bank, "World Development Indicators" [online database] http://devdata.worldbank.org/dataonline; and Science and Technology for Development (CyT-DES) [online] http://www.cepal.org/iyd/.

Table III.1 includes indicators of innovation efforts and their results for a series of countries. In terms of efforts to innovate, indicators include the number of researchers for every one million inhabitants, spending on R&D as a percentage of GDP, and the breakdown of that percentage by the sector providing the required financing. The following observations can be made based on these indicators. First, the number of researchers per million inhabitants in the region is around one tenth of the number observed in developed countries. However, the region does not fare too poorly when this

[3] Although there is consensus that measuring innovation involves more than assessing R&D spending, the latter is nonetheless a useful indicator for comparing the efforts of countries.

indicator is compared with the results in some other developing countries such as China, India and Malaysia. Second, R&D spending barely exceeds 0.5% of GDP in the region, which is a quarter of the world average and below the figures for China, India and Malaysia.[4] Third, most of the limited resources that Latin American and Caribbean countries invest in R&D are governmental in origin, while the contribution of businesses is much lower.[5] The opposite is true in more advanced countries: public resources are supplemented by a higher level of business investment in R&D (see table III.1 and Science and Technology for Development (CyT DES),[6] no date).

Table III.1
INDICATORS OF SCIENTIFIC BASE AND INNOVATION EFFORTS AND EFFECTIVENESS

	Innovation efforts					Effectiveness of innovation efforts		
	Number of researchers per million inhabitants (average 2000-2004)	R&D spending as a percentage of GDP (average 2002-2004)	R&D spending by sector of financing (percentages of total, average 2000-2004)			Number of scientific and technical articles for every million inhabitants (2003)	Number of patents granted by USPTO [d] (cumulative, 2000-2006)	Patents granted by USPTO as a percentage of the total granted to non-residents (cumulative, 2000-2006)
			Government	Business	Other [c]			
Argentina	727	0.42	43	26	31	81	330	0.060
Bolivia	120	0.26	20	16	64	4	2	0.000
Brazil	434	0.94	58	40	2	48	738	0.135
Chile	682	0.68	47	42	11	94	88	0.016
Colombia	105	0.17	13	47	40	8	58	0.011
Costa Rica	...	0.37	...	...	...	20	27	0.005
Ecuador	47	0.07	...	...	...	2	15	0.003
Guatemala	...	0.08	...	...	...	1	7	0.001
Honduras	...	0.06	...	...	...	2	4	0.001
Mexico	321	0.43	55	35	10	37	568	0.104
Panama	97	0.31	29	0	71	12	8	0.001
Paraguay	80	0.09	63	0	37	1	1	0.000
Peru	...	0.12	...	...	...	5	23	0.004
Uruguay	366	0.22	17	47	36	57	10	0.002
Latin America and the Caribbean	298 [b]	0.55	55	37	8	27	1 879	0.34
G-8	3 412 [a b]	2.5	28	64	8	613	424 785	63.33
Australia	3 924	1.62	41	51	8	794	6 530	1.197
New Zealand	3 945	1.16	45	38	16	759	906	0.166
China	517	1.27	28	63	9	23	2 367	0.434
India	120 [a]	0.7	76	20	4	12	2 128	0.390
Malaysia	300 [a]	0.6	27	61	12	21	550	0.1
Republic of Korea	3 187 [a]	2.59	24	74	2	288	29 270	5.366
Singapore	4 699	2.14	41	52	7	743	2 558	0.469
Finland	7 749	3.47	26	70	4	1 000	5 612	1.029
Ireland	2 521	1.12	30	61	10	440	1 068	0.196
Norway	4 595	1.71	42	49	9	726	1 724	0.316
Spain	2 189	1.07	40	48	12	401	1 983	0.364
World	...	2.23	31	62	7	158	1 141 751	...

Source: World Bank, Knowledge Assessment Measure (KAM); United States Patent and Trademark Office (USPTO); United Nations Educational, Scientific and Cultural Organization (UNESCO); Organisation for Economic Co-operation and Development (OECD), *Main Science and Technology Indicators*, Paris, 2007.

[a] Information corresponds to 2004.
[b] Simple average.
[c] Includes higher-education and non-profit institutions and external funds.
[d] United States Patent and Trademark Office.

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4 Brazil is the region's only country where this indicator is higher than in India and Malaysia.
5 Given that most of the R&D spending in Latin American countries corresponds to State universities, the proportion financed by the government is estimated to be even more than the 55% indicated in table III.1 if added to part of the percentage classified as "other".
6 See the more detailed figures in the Info-Data section.

These indicators suggest that innovation patterns are asymmetrical. While in Latin America and the Caribbean most R&D activities are geared towards science and basic research, in countries at the cutting edge of technology R&D is focused on applied and experimental development. In this region, R&D is carried out mainly in public laboratories and universities, whereas such work is conducted chiefly by businesses in other countries. This is in response to structural change and efforts to improve the level of technology. Public-sector participation is a fundamental component of the first innovation phase in countries that have successfully built their own technological capacity and been able to move on from adapting technology to creating it. Investment in R&D increases as the production structure becomes specialized in more complex scientific and technological sectors and activities, although a relatively small proportion of the increase comes from government. Given that most of the region's countries are at this first stage, the most worrying aspect is not the limited participation of the private sector, but rather the low level of investment in this type of activity and the lack of applied development. It is also interesting to note that there tends to be more public funding in developed countries where the production structure (especially in terms of exports) is linked to natural resources, as is the case for Australia, New Zealand and Norway.

The second part of the table includes indicators of the effectiveness of efforts made in science and technology. In Latin America and the Caribbean, the countries with the highest number of scientific and technical articles published per million inhabitants are Argentina, Brazil, Chile, Mexico and Uruguay. In these countries, the indicator is higher than in other developing countries. However, the cumulative number of patents granted by the United States Patent and Trademark Office (USPTO) between 2000 and 2006 and the percentage this represents of the total granted to non-residents in the same period, show that the region is a marginal player that does not fare as well as China and India.

Lastly, figure III.2 illustrates an indicator of the "effectiveness" of R&D spending.[7] Although the aim of R&D spending is not always to patent an invention, and while the sectoral distribution of patents granted is acknowledged as being strongly asymmetrical as some sectors are more likely than others to apply for patents, this indicator nonetheless helps to identify three groups of countries.[8] The main group is made up of countries with a large capacity to convert R&D investment into exportable goods and services or processes that can be patented: Canada, Finland Japan, Republic of Korea, Singapore and the United States. The middle group with slightly lower (although still high) levels of efficiency comprises Australia, Ireland, New Zealand and Norway. The third group features the countries of Latin America and the Caribbean and some emerging economies such as China and India, where expenditure on R&D yields fewer patents than in the case of the developed countries. This is due to a combination of factors: less efficiency and a propensity to adopt existing technology.

However, the difference between China, India and Latin America is not exclusively related to the effort represented by R&D spending (as shown in table III.1), but also to different patterns in recent years in terms of the number of patent applications. China and India have been more active in this regard during the past five years. In 2000, China obtained 119 patents with USPTO, India 131 patents and Latin America 293 patents, with these figures changing to 661, 481 and 277, respectively, by 2006. Brazil leads the region with 121 patents. The above suggests that the region is still lagging behind in terms of efforts to adopt and create new technologies. China, in particular, has successfully imitated and adapted new technologies to create its own technological capacity. Closing the gap is a key challenge for Latin America in the coming years (Cimoli, Coriat and Primi, 2008).

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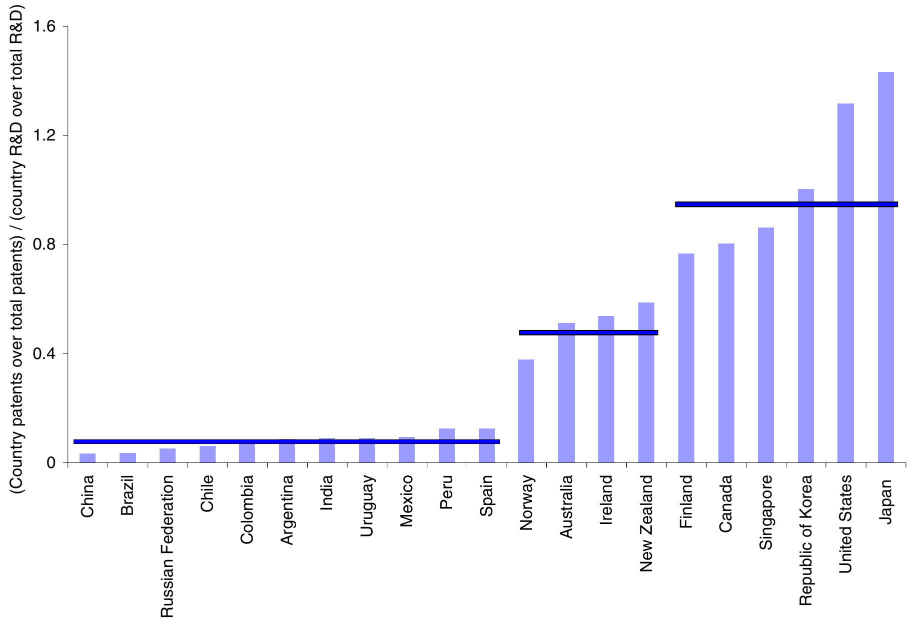
7 The relative participation of each country in the total number of patents was calculated on the basis of the cumulative number of patents awarded by USPTO between 2003 and 2006, in relation to the percentage of each country's total R&D spending, based on total investment between 2000 and 2003. The total refers to patents granted and the expenditure of selected countries in table 2. This includes a time lag between the R&D spending and the number of patents granted, so as to take account of the interaction between investment and patents.

8 See Cimoli and Primi (2008) and Díaz (2008).

Figure III.2
SELECTED COUNTRIES: EFFECTIVENESS OF PATENTS IN TERMS OF INVESTMENT IN RESEARCH AND DEVELOPMENT



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of United States Patent and Trademark Office (USPTO); United Nations Educational, Scientific and Cultural Organization (UNESCO); Organisation for Economic Co-operation and Development (OECD), *Main Science and Technology Indicators*, Paris, 2007; and Ibero-American Network of Science and Technology Indicators.

B. The innovation dynamism of Latin American businesses

Unlike the information sources traditionally used (spending on R&D, patents, publications, etc.), national innovation studies have certain advantages that are key to understanding innovation dynamism at the level of firms.[9] With a few exceptions, innovation surveys in Latin America only include manufacturing, and the analysis therefore concentrates on that sector. Although this may well underestimate the innovation potential of economies based on agriculture and mining, innovation in manufacturing provides a good initial approximation of the capacities of the economy as a whole. That is partly because the manufacturing sector usually has stronger capacities, and partly because these capacities reflect the general science and technology situation of the country concerned. A country that is innovative in manufacturing is probably innovative in other sectors.

However, despite the benefits of national innovation surveys, they also have some disadvantages: one example is the subjectivity of replies, as most of the questions are qualitative and therefore depend largely on the perception of those completing the form, which can lead to conclusions that do not reflect reality.

Due to the characteristics of such surveys, the following sections examine qualitative indicators (for example, whether the firm is innovative or not) along with a set of quantitative indicators to measure the level of innovation efforts and their results. Using this type of data helps

[9] According to a detailed analysis of the questions included in the surveys (see the Oslo Manual (OECD, 1992) and the Bogotá Manual (Jaramillo, Lugones and Salazar, 2000)), it is possible to identify many types of innovation-related activities and to include economic spillovers involving the market and knowledge spillovers.

to complete the picture of the intensity of innovation and its effects on various sectors and countries in Latin America.[10]

In the next few sections, national innovation surveys carried out in six of the region's countries (Argentina, Brazil, Chile, Colombia, Mexico and Uruguay) are used as the basis for examining indicators of how innovation affects the results of firms in terms of productivity, wages and exports. Also described are factors that boost or hamper innovation, cooperation between businesses and universities and as yet uncharted territory for innovation in natural-resource-intensive sectors.

1. Innovation and company performance

(a) Innovation intensity

The first aspect worth considering is the average percentage of innovative firms in the field of new product or process technologies in the Latin American countries in question. According to data from the region's national innovations studies, this percentage is around 38% (with a maximum of 43% en Uruguay and a minimum of 32% in Chile),[11] whereas the percentage in the European Union for the period 1998-2000 was 44%, according to the Third Community Innovation Survey (CIS3). In terms of the type of innovation, this tends to be concentrated in processes rather than products (except in Colombia, where the percentage is practically the same for products and processes). Having said that, firms that introduce innovations at the level of processes also tend to do so in relation to products. The correlation coefficient between firms innovating in products and processes is fairly significant: Argentina, 0.63; Brazil, 0.55; Colombia, 0.82; Mexico, 0.45; and Uruguay, 0.65.[12]

A consideration of each country's most innovative firms revealed some interesting results, as there seems to be a clear sectoral component in the ability to introduce new processes, products or both. Firms with above-average levels of innovation tend to be active in chemicals and pharmaceuticals, machinery and equipment, and in the automotive, petroleum and metal sectors. Latin America therefore shows the same intersectoral differences of innovation intensity observed in studies of other parts of the world.[13]

(b) Productivity and export performance

One aspect not to be forgotten is that of the aims of innovation, which are mainly to increase productivity, open up new markets, reduce costs, enhance product quality and improve environmental management.[14]

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[10] The definitions and concepts used are from the Oslo and Bogota Manuals. Unless otherwise stated, the information available covers the following years and countries: Argentina, 2005; Brazil, 2001-2003; Chile, 1998-2001; Colombia, 2003-2004; Mexico, 1999-2000; and Uruguay, 2001-2003.

[11] The percentages refer to the following time periods: Argentina, 2005; Brazil, 2001-2003; Chile, 2003-2004; Colombia, 2003-2004; Mexico 1999-2000; and Uruguay, 2001-2003.

[12] Calculations were carried out using the Kendall tau correlation coefficient, as this is more appropriate for ordinal or dichotomous variables than the one usually used (Pearson's coefficient) (Sandven, Smith and Kaloudis, 2005).

[13] See chapter 2, in which these differences are used to construct indicators of structural change within the economy.

[14] There are several studies analysing the effects of innovation on productivity in some of the region's countries, including the one by Chudnovsky, López and Pupato (2006) on Argentine industry in the period 1992-2001, another by Benavente (2006) concerning Chile and one from De Negri, Salerno and Barros de Castro (2005) about Brazil. Although they do not measure innovation and productivity in the same way, all concluded that innovation spending was a major factor in increased productivity in firms.

The link between innovation and productivity remains a source of debate in studies on the subject, and certain methodological limitations are still an issue (Sandven, Smith and Kaloudis, 2005). In the case of national innovation surveys, the problem is measuring productivity, as there are no data available on value added at the level of firms. However, it is possible to produce a substitute productivity variable based on the ratio between sales and the number of employees, and this variable has been used to estimate the link between innovation and productivity (see table III.2, which shows a highly significant positive relationship between the two variables).

Table III.2
INNOVATION: LINKS TO PRODUCTIVITY AND EXPORTS
(Kendall tau-b correlation coefficient)

	Argentina	Brazil	Colombia	Mexico	Uruguay
Productivity	0.1259	0.1846	0.1248	0.1596	0.2068
Exports	0.2467	0.234	0.07	0.1621	0.267
Number of observations	1 399	10 251	5 385	1 608	809

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of national innovation surveys.

Note: In all cases, the level of significance was very high.

Another key variable of the results is external competitiveness, as reflected by exports. Innovation can affect exports in many ways. One example is the above-mentioned increase in productivity, which helps to bring down production costs.[15] In other cases, the aim of innovation is to achieve the quality standards needed to break into new markets. It is therefore interesting to analyse the link between exports and innovation (as seen in the second row of figures in table III.2). The correlation coefficients confirm that there is a positive and highly significant relationship between the two variables.[16]

In summary, the coefficients point to a positive and significant relationship between innovation and company results, with the latter defined by both productivity and export capacity. There do not appear to be major differences in the coefficients of various countries, except for Colombia, whose export coefficient was very low, and Uruguay, which posted the highest values. The results for Latin American industry confirm the hypothesis put forward by Crespi and Patel (2007), who used a panel study to find a positive non-linear relationship between competitiveness and innovation.

(c) Productivity and company size

As shown above, there is a strong positive relationship between innovation and productivity. It is interesting to ascertain the extent to which this depends on company size, due to the implications this would have for policymaking.[17]

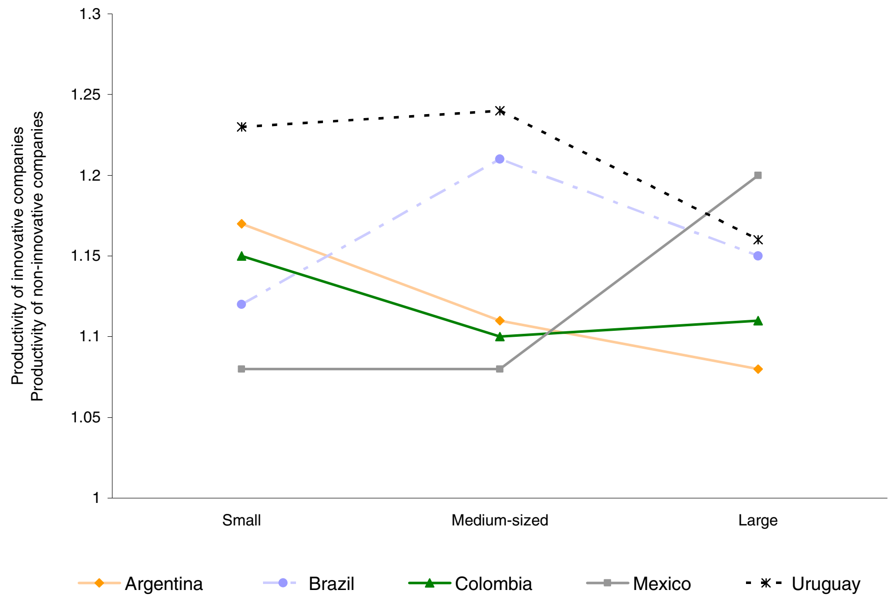
To analyse the effect of company size on innovation, firms were categorized as follows: small (fewer than 50 workers), medium-sized (employing 50 to 99 workers) and large (100 workers or more). A comparison between innovative and non-innovative companies (in terms of products and processes) reveals that the former are more productive than the latter across all company sizes. Furthermore, there was no common pattern among countries in terms of the relationship between size and increased productivity based on innovation (see figure III.3). What did emerge is that innovative firms are between 8% and 24% more productive than those that do not innovate.

15 Despite the ongoing and inconclusive debate surrounding the causal link between exports and innovation, analysing the topic in more detail would go beyond the scope of this document.

16 Exports were considered a dichotomous variable, with value 1 assigned to cases where the company reported some export activity.

17 Given the high variability of the sales/employment indicator and the presence of outliers in the sample, it was necessary to use a normalization procedure to limit their influence. Once the sales/employment coefficient had been calculated, companies were accordingly ranked smallest to largest and split into 10 equal-sized groups. The first group (with the lowest productivity) was assigned the value 1, the second value 2, and so on, with the most productive group of companies having value 10. The new productivity indicator therefore uses the scale 1 to 10.

Figure III.3
LATIN AMERICA (5 COUNTRIES): PRODUCTIVITY DIFFERENCES AMONG INNOVATIVE AND NON-INNOVATIVE COMPANIES



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of national innovation surveys.

As far as sectoral patterns are concerned, in all sectors innovative companies had higher productivity than those that did not introduce changes into their production processes or products. However, calculations showed that the extent to which companies from certain sectors benefited varied considerably among countries, although no one common pattern emerged. What can be said is that the machinery, electrical appliances and transport materials sectors tend to see higher increases in productivity as a result of innovation, which is to be expected given the greater level of technological complexity involved. In summary, innovation has positive effects on company productivity, irrespective of company size and sector, with a slight tendency for the impact to be stronger in sectors that make more intensive use of engineering.

(d) Innovation and wages

As with the positive links between innovation and two key indicators such as productivity and exports, there is a similar relationship with wages and the skills of workers in innovative firms. In Brazil (the only country with the necessary information available in this case), there is a fairly significant difference in wages (of around 45%) between the employees of innovative and non-innovative companies. This is probably due to the different endowments in human capital among the firms concerned, and confirms the findings of De Negri, Salerno and Barros de Castro (2005).

This idea is based on evidence that came to light when companies engaged in product-based innovation were classified according to whether the innovation was for the company, for the national market or the international market. For the national and international markets, the demand for human capital is naturally higher than in the case of innovation for the company. Table III.3 shows the positive relationship between the level of complexity of the innovation and level of schooling and wages.[18]

[18] An indicator of the skill level of companies' R&D staff was constructed using all workers with qualifications (professional doctorate, masters or degree) working in that area.

Table III.3
BRAZIL: SKILLED WORKERS AND LEVEL OF WAGES BY TYPE OF INNOVATIVE FIRM

	Skilled workers (number of people working in R&D)[a]	Average wages (annual salary per worker, in US$)
New products for the company	6	12 650
New products for the national market	21	22 508
New products for the international market	68	28 448

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of the Brazilian Geographical and Statistical Institute (IBGE), Industrial Survey of Technological Innovation (PINTEC), 2003.

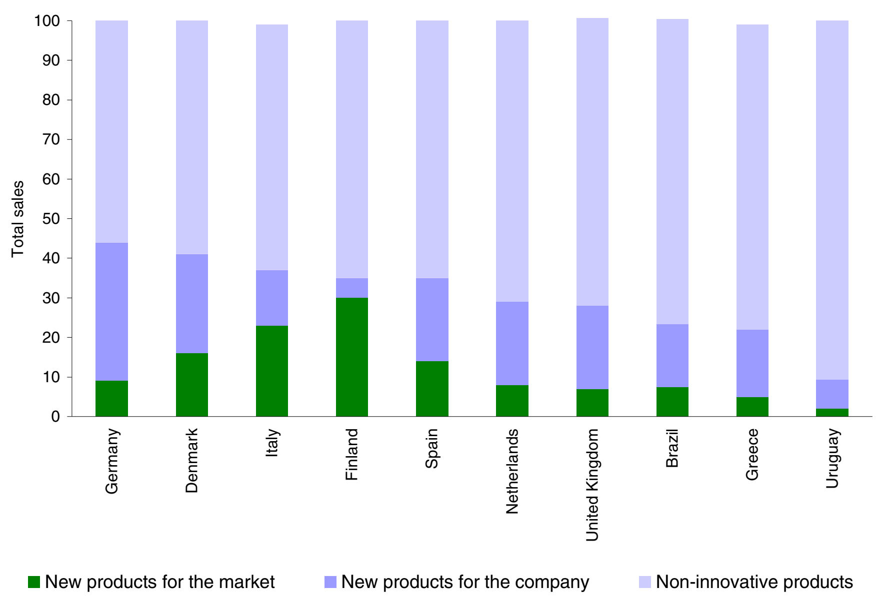
[a] Full-time employees.

Lugones, Suarez and Gregorini (2007) also analysed the relationship between wages and innovation in a study on Argentine firms. According to their findings, companies that carry out innovation activities achieve better results in the long term, which combines with improved productivity and workers' skill levels and wages received.

(e) Type of innovation and company sales

Another way of assessing the importance of innovation for company performance is through its effect on sales. Figure III.4 compares the percentage of sales due to product innovation in some Latin American countries with the data from the Third Community Innovation Survey (CIS3) for a reference group of European countries.

Figure III.4
SELECTED COUNTRIES: DISTRIBUTION OF SALES BY TYPE OF PRODUCT
(Percentages)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of national innovation surveys in Latin America and the European Community's Third Community Innovation Survey (CIS3).

Although the values in the figure are from different years, the implications are nonetheless clear.[19] The two Latin American countries for which information was available are in the group of nations where companies incorporate fewer new products in their sales, although the situation of Brazilian firms is extremely different from that of their Uruguayan counterparts.

In summary, the new evidence provided by national innovation surveys confirms the key role played by innovation in company results. From the point of view of productivity, exports and wages, innovative companies outperform those that do not innovate. What is more, the effects of innovation on productivity do not depend on company size, such that many different sectors may reap the benefits on offer. Lastly, within the sample of the region's countries, sales of new products (usually linked to innovation) represent a smaller percentage of the total than in developed countries.

2. Some factors affecting innovation

Activities related to innovation efforts include measures aimed at applying the concepts, ideas and methods that companies need to acquire, assimilate and incorporate new knowledge. Spending on concrete innovation tasks can be broken down into five main groups: R&D activities, industrial design and engineering, training, embodied technology and disembodied technology.[20]

What type of activity forms the focus for innovation efforts in Latin American countries? As shown in figure III.5, the region's companies tend to use rather than produce knowledge, so that they tend to acquire embodied technology (especially in the form of machinery, equipment and computer hardware and programs) created in other countries and regions. Although this suggests that, as stated previously,[21] the incorporation of technology in developing countries often results from the acquisition of equipment, it is nonetheless worrying that companies invest so little in other in-house innovation activities.

As for the particular situation of each country, total spending by Brazilian companies is higher and better distributed among the various activities than in other countries.

(a) Cooperation in innovation

A key aspect of innovation is cooperation among the various relevant public and private actors. As mentioned previously, the systemic dimension of innovation is one of the main features of modern technological learning theories. The concept of a national innovation system originally put forward by Freeman (1982) and Lundvall (1985), and revisited by Metcalfe (1995), emphasizes that technical progress is the result of interaction between the various agents that generate, apply, adapt and improve new technology, so that countries' level of innovation will depend largely on the degree of cooperation that exists between stakeholders.[22]

The level of cooperation can be assessed by analysing information sources that companies use to innovate, which can be classified as follows: information generated in-house; external information from suppliers of raw and other materials, buyers and competitors; and lastly, information provided by universities and research or training centres. According to data from the innovation surveys, Latin American companies attach little importance to the latter source, which has significant implications for the type of innovation under way in the region. This can also be an indication of the relevance of the content of activities carried out by such centres. Given that

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[19] Data for the European countries are from the year 2000, while the data for Latin American countries correspond to 2003. Different surveys were used as well: the structure employed for the European and Brazilian companies was based on the Oslo Manual, while the Bogotá Manual served as the basis for the survey conducted for Uruguay.

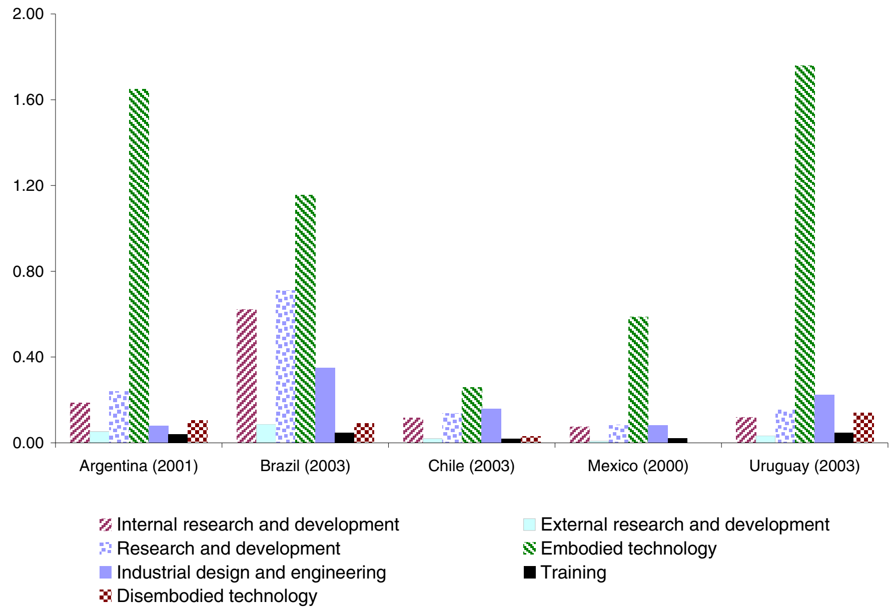
[20] For a detailed description of these and other definitions, see the Oslo Manual (OECD, 1992).

[21] See chapter I, section C, as well as section A of this chapter.

[22] See Nelson (1993); Cimoli and Dosi (1995); Patel and Pavitt (1994); Metcalfe (1995) and Cimoli and others (2006a).

the internal expenditures are low and there is limited cooperation with external centres, innovations tend to be minor or incremental and to be associated with small variations in existing products and processes.[23]

Figure III.5
LATIN AMERICA (5 COUNTRIES): SPENDING RELATED TO INNOVATION, BY TYPE OF ACTIVITY
(Percentages of sales)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of national innovation surveys.

In this sense, it would be interesting to find out the extent to which cooperation affects a given company's ability to be innovative (see table III.4). Comparing the two columns reveals that there are more innovative firms among those with some cooperation mechanism than among those with none.

Table III.4
SELECTED COUNTRIES: COOPERATION AND INNOVATION
(Percentages)

	Companies that cooperate and innovate/total that cooperate	Companies that do not cooperate and innovate/total that do not cooperate	
	(A)	(B)	A/B
Argentina	68.0	29.8	2.28
Brazil	94.5	40.2	2.35
Uruguay	55.8	16.3	3.41

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of national innovation surveys.

Note: The surveys in Argentina and Uruguay do not include questions on the intensity of cooperation. In Argentina, firms reporting active cooperation were included, while for Uruguay, any firm reporting some cooperation was included.

23 Many types of innovation require the use of additional resources (including knowledge and information) that come from outside companies themselves. For the transfer of innovation-related assets between the various stakeholders to be feasible, it is vital to create an environment conducive to cooperation (Fristch and Lukas, 2001). The many studies carried out into the importance of cooperation or the creation of innovation networks over the last decade (Knell and Srholec, 2005; Laursen and Salter, 2005; and Veugelers and Cassiman, 2005, and so on) have confirmed the link between cooperation and innovation. Establishing communication with other companies and institutions that make it possible to pass on accumulated knowledge boosts the innovation capacity of firms and results in lower costs and reduced risks associated with innovation activities. Although the type of cooperation varies according to the agent involved (other companies, universities or government agencies) or its objective (gradual or radical innovation of product or process, for instance), what seems clear is that cooperation is always positive in the context of innovation. As pointed out by Freel and Harrison (2007), "cooperation is good, more cooperation is better."

It would also be worth considering which external agents have the most positive influence on innovation. There are significant differences in this respect between Brazil and Uruguay. In Brazil, all forms of cooperation are equally important, including that of learning from the activities of competitors. In Uruguay, more emphasis is placed on cooperation with universities and public entities. One working hypothesis could be that Brazilian companies, which are larger and have a higher financing capacity, are also less dependent on the support of public institutions in terms of R&D.

There can be no cooperation without internal capacity, as it is the latter that provides the necessary boost to using the assets of other agents. Companies with a high “absorption capacity” could therefore be expected to be able to establish agreements with other actors in the innovation system. The concept of “absorption capacity”, introduced by Cohen and Levinthal (1990), implies a certain skill for assessing, assimilating and using external knowledge, which means there is a positive link between companies’ innovation activities and cooperation. Investing in knowledge not only enables companies to increase their internal capacity, making it more attractive from the viewpoint of cooperation, but also helps them to identify relevant stakeholders and become actively involved in new projects.

Companies that cooperate with other agents within the system tend to be much more intensively involved in innovation activities.[24] In Brazil, for example, 25% of companies that cooperate invest in external R&D, although that percentage is only 2% among firms that do not cooperate.

In summary, the innovation profile of Latin American countries is strongly biased towards the acquisition of technology and limited internal learning efforts. Also, companies do not cooperate with other public and private actors, thereby reducing the learning capacity of the economic system even more. There is therefore large scope for implementing policies aimed at strengthening such links, bearing in mind that public and private research capacities are complementary rather than in opposition with each other.

(b) Obstacles to innovation

A key issue in the context of policies are the obstacles that companies face in carrying out innovation activities. These obstacles can be classified as microeconomic, mesoeconomic and macroeconomic.[25]

Analyses brought to light some major differences at the national level. The countries where companies face the highest number of innovation obstacles are Chile, Uruguay and Colombia, with more favourable conditions in Brazil.

The analysis of patterns in various spheres revealed some interesting results. There are striking differences among countries. At the microeconomic level in Chile, for instance, there is a lack of skilled workers and a long period for return on innovation investment, while in Uruguay there is more concern for investment risk and yield. At the mesoeconomic level, the main problems are access to financing and, in Uruguay, the size of the domestic market. At the macroeconomic level, the absence of public policies in science and technology is a problem in Chile, while the high cost of training is an issue in Brazil and Argentina.

There are significant differences among countries in terms of the main perceived obstacles to the innovation process. In some cases, obstacles relate to policy shortcomings, such as the lack of a science and technology system or the limited supply of skilled workers. In other cases, there are more typical problems associated with the uncertainty of the innovation process itself, which could be mitigated through improved financing and greater access to information.

[24] See Primi and Rovira (2007).
[25] The analysis only included national companies, defined as those with no percentage of foreign capital.

(c) Financing of innovation

The difficulty of financing innovation in the region lies in the weakness of the prevailing institutional framework and the lack of an integral support system for the various activities involved. The basis of financing companies is to support the creation of new products and processes at the prototype or pre-competition phase and covers all stages from the launch of commercial production through to any subsequent expansion. From this point of view, each stage of the innovation process represents a series of challenges that call for specific mechanisms if they are to be overcome (Baygan, 2003; EVCA, 2003). Several such mechanisms are beginning to be introduced in the region, although they are at an early stage.[26] They include the following:

- Non-reimbursable contributions and subsidies for the costs incurred in the initial stages of innovation activities. These are usually subject to certain eligibility criteria to target certain companies and the formation of clusters of innovative firms, business incubators and venture fundraisers.[27] In this region, such programmes have been implemented thanks to certain development agencies or at times with resources from intellectual property rights or specific taxes.

- Tax incentives to support R&D spending in companies and the creation of innovative enterprises. Such incentives tend to take the form of tax credits or discounts for R&D spending, in accordance with certain eligibility criteria, and tax exemptions on capital gains.[28]

- Mechanisms aimed at reducing the credit risk of entrepreneurs, facilitating access to long-term financing through programmes that guarantee the granting of loans, subsidies for credit insurance premiums and preferential rates for credit lines.

- Systems for raising public and private venture capital for the initial stages (seed capital), start-up and expansion, which is sometimes supplemented by specialized financial mechanisms for the sale of new enterprises to provide an exit strategy for those investing in venture capital (Echecopar and others, 2006; Córdova, 2005; and Charvel, Gonzales and Olivas, 2006). In addition, Brazil is witnessing significant development in stock-market segments geared towards overcoming the problems and conflicts of interest that characterize the financing of new and innovative firms that prevent the participation of minority investors. In recent years, these new market segments have channelled a growing number of contributions to new enterprises, many of which were previously financed by the venture capital system and public innovation-support programmes. This has reactivated the local capita market.

As well as those mechanisms, the region’s countries have also made considerable efforts to support innovation and encourage the link between R&D institutions and businesses. The following box summarizes some features of the innovation law that came into force in Brazil in 2005, the novelty of which is the way of establishing links between public and private agents of innovation.

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[26] See the instrument databases of the Science and Technology for Development (CyT DES) website, (no date); Cimoli, Ferraz and Primi (2005); Jiménez (2006 and 2007).

[27] In the United States, through Small Business Innovation Research, such programmes played a key role in supporting small high-technology enterprises with positive results, especially when they were located in geographical areas with a high concentration of innovation activities (Gompers and Lerner, 1998).

[28] Although, according to OECD (2007a), there is debate over their effectiveness in promoting innovation and securing the necessary funding, a growing number of countries have preferred to use these incentives rather than supporting initiatives directly (Gompers and Lerner, 1998; Hellman, 1998; Poterba, 1989; Da Rin, Nicodano and Sembenelli, 2005).

Box III.1
BRAZIL: LAW ON INNOVATION

The law on innovation provides financial support and encouragement to individuals, enterprises and institutions involved in the innovation process and for the conclusion of contracts between them (in exchange for a share of the financial rewards. More specifically, the law focuses on:

- Support for commercial interaction between public and private entities. This enables public-sector institutions to set up strategic alliances and conclude contracts with science and technology institutions,[29] private enterprises and non-profit private-law organizations for the purposes of R&D activities aimed at creating innovative products and processes. The law therefore authorizes the paid use of laboratory installations and other equipment of those institutions for small and medium-sized private enterprises to carry out innovation and creative activities and for research activities in general. The law also authorizes the public sector and certain public entities to hold a minority interest in the capital of private companies that have been specifically set up to develop scientific and technological projects to create innovative products and processes. The intellectual property right on the results is in proportion with the capital share held.
- Encouraging the participation of science and technology institutions in the innovation process. This includes provisions that allow those institutions and their staff to take part in innovation processes and receive financial benefits. This authorizes them to conclude contracts on transferring technology and granting the right to use technological creations developed and to provide R&D services to private enterprises. Civil servants who participate in such services are able to receive additional remuneration as a result of these contracts. The inventors or creators of products or services that are the subject of licence or technological transfer are entitled to between 5% and 33% of the net profits that such activities generate for the science and technology institutions. The law also allows such officials (whether they are researchers or creators) to take unpaid leave from work to set up an enterprise to develop business activities related to their particular innovation.
- Boosting company innovation activities. The law authorizes the establishment of mutual investment funds for enterprises whose main activity is innovation and for independent inventors. Once there is proof that the patent has been granted, they may then seek to have it adopted by science and technology institutions and even sign contracts handing over the rights of exploitation. The law authorizes public entities to recruit private enterprises, in matters of declared public interest, to carry out R&D activities into innovative products and processes, with a view to solving specific technical problems of those institutions.

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of law No. 10.973, Brazil, 2 December 2004.

(d) The sectoral aspect of innovation

Given the characteristics of the production structure in the region's countries, one of the most noteworthy aspects is innovation in natural-resource-intensive sectors. The challenge facing firms working in those sectors is to modify and improve their products and processes by incorporating new technologies and services, expanding their participation in world trade and increasing the value added of the goods involved. These objectives are achieved through innovation. It is particularly interesting to compare the extent to which innovative activity in such sectors is similar to that under way in developed countries.

Some interesting results emerge from a review of the distribution of innovation activities by sector in two of the region's countries (Colombia and Mexico, on the basis of national innovation surveys) and in two European countries where low-technology products form a major part of the specialization pattern (Netherlands and Norway,[30] based on CIS4). In the Latin American countries, innovation activities are focused on the purchase of machinery and equipment (except in some sectors such as pharmaceuticals and the oil industry in Mexico). In the European countries, spending appears much more evenly spread, with a slight bias towards R&D. This happens not only in sectors that use R&D and technology more intensively (such as pharmaceuticals or electrical

[29] The law defines these as public bodies or entities with an institutional mandate to, inter alia, develop basic and applied scientific or technological research.

[30] According to Smith (2006), Norway and the Netherlands are both countries where development has been influenced by industry based on natural resources.

machinery), but also in sectors firmly based on natural resources or low-intensity technology (such as clothing and foodstuffs).

In the Netherlands and in Norway, thanks to their higher level of development, there is no substantial difference between the low-technology sector and other sectors of the economy in terms of the distribution of internal and external spending on R&D.

In brief, the foregoing observations point to the importance of considering sectoral differences when assessing countries' R&D spending, irrespective of the major differences between the natural-resource-intensive sector in the region's countries and their counterparts in developed countries. This implies that there is scope for increasing spending, which could result in the introduction of new products and processes and in product differentiation. However, two obstacles must be borne in mind. First, many enterprises working with natural resources (particularly the extraction industry) belong to global conglomerates whose R&D activities are concentrated in specialized centres located in developed countries. Second, many producers of goods based on natural resources are part of global value chains run by transnational corporations that control key technological inputs and the generation and diffusion of technology within the chain.

3. Innovation dynamism of companies: efforts and opportunities

Aggregate and comparative analyses of countries reveal the region's relatively poor performance and the mismatch between the innovative R&D efforts of Latin American countries and their actual effectiveness. However, a study of innovation at the microeconomic level shows a significant relationship between company innovation and results, from the point of view of productivity as well as exports and workers' skills and wages. It should be pointed out that the causal link is far from clear, as improved exports and skill levels are both cause and effect of companies' attitudes to innovation. Nonetheless, increasing productivity, export performance and demand for skilled labour naturally requires innovative companies. It has also been observed that the positive effects of innovation on increases in productivity are not particularly determined by company size, irrespective of the fact that the smallest companies have lower levels of productivity than the very largest.

At the same time, deficiencies were identified in the innovation process, which was shown to consist essentially in the purchase of equipment or inputs, with a low level of in-house efforts to adapt and improve technology. It could be argued that this may be partly due to the development stage of the economies in question, yet the low levels of cooperation with other public and private agents such as suppliers, competitors, universities and research centres are nonetheless a cause for concern. The lack of cooperation is highly significant, as all evidence points to companies that cooperate being more likely to innovate. The absence of such links in the economies analysed is worrying because it makes it difficult for them to move to a more advanced stage of innovation. What is more, low levels of R&D investment reduce cooperation, as such investment is partly dependent on the capacity of companies to offer complementary technological assets. The main means of technical change is therefore imported technologies in their embodied and disembodied forms. Increased endogenous efforts are thus needed to absorb, modify and improve them.

The above-mentioned deficiencies are reflected in the limited capacity of Latin American enterprises to make a mark for themselves in innovation activities that involve significantly new ideas. Although rates of technological innovation are not much lower than in developed countries, the type of innovation is undeniably different. The region has been unable to make progress in introducing new products, either on the domestic or international markets.

Firms perceive a wide range of obstacles to innovation, two of which are worth mentioning, due to their importance for policymaking: the lack of a science and technology system capable of providing technological support to companies' innovation efforts, and problems relating to staff training. Another stumbling block is financing, which is crucial to an activity characterized by high levels of uncertainty.

Another relevant aspect in the context of innovation-based development strategies is that, while there may be intersectoral differences in innovation intensity, there are also major differences between Latin America and developed economies within natural-resource-intensive sectors. Such differences suggest that there are opportunities there for the taking. Other chapters of this document have shown that progress can be made in traditionally homogeneous sectors, where product differentiation and market diversification are indeed possible. This calls for more intensive innovation efforts, similar to those observed in developed countries.

C. Learning, quality and the integration of Latin America and the Caribbean into the world economy

The capacity to add value to products is largely dependent on efforts geared towards innovation, in the broad sense of the term. It is vertical quality differentiation processes that produce virtuous linkages with the rest of the economy, thereby contributing to the diversification of the production structure. In this context, improving quality in developing countries is mainly dependent on the imitation of more efficient techniques or processes, the application of certain quality certification or standards to production processes, the introduction of improvements in corporate organization, an increase in worker skill levels and the enhancement of commercialization strategies.

Above and beyond factor endowment and sectoral specificities (natural resources or manufactures with various levels of technological content), the empirical literature on the subject recognizes a disaggregated level (varieties) in which specialization is basically determined by the capacity for vertical product differentiation (Schott, 2004; IMF, 2006; Hummels and Klenow, 2005). This means that products are distinguished for the innovation and quality incorporated as a result of efforts expended. Increased quality in this context means products will be more positively valued by purchasers, thereby increasing their willingness to pay a higher price for them. Greater value added will give rise to higher wages and profits (Aiginger, 2001). Newly incorporated attributes can be tangible (size, speed, capacity and durability) or intangible (reliability, brand image, design, packaging, product compatibility, flexibility of use, maintenance services, etc.).

The vertical differentiation of products applied to all technological categories of exports. Obviously, this is not to deny that higher-technology goods tend to be more buoyant, both in their links with domestic economic activity and the greater elasticity of international demand, but simply to recognize that vertical product differentiation in each technological category is a vital manifestation of innovation (in this case represented by the quality of the competitiveness dynamic of the region’s countries) (Machinea and Vera, 2007).

1. Quality and technological intensity of exports

(a) A comparison with developed and developing countries

As in many empirical studies on vertical differentiation in world trade, this document considers that a greater export unit value (value/export volume) is reflected in increased willingness to pay for a given product, due to the incorporation of a higher level of quality.[31] The data on unit values come from

[31] See, for instance, Aiginger (1997, 2001), Greenaway, Hine and Milner (1995), Fontagné and Freudenberg (1997, 2002), Fontagné, Freudenberg and Gaulier (2005), Fontagné, Gaulier and Zignago (2007) and Schott (2003, 2004). Although the unit value (price) tends to be a good indicator of the quality of a product, there are several factors that may alter that value with no change in quality. These factors include variations in production costs and the exchange rate, uncompetitive markets (where prices may reflect monopolistic or oligopolistic practices), trade barriers, transnationalization of production or franchise regimes and the use of transfer pricing (as in the maquila sector). For further details, see Machinea and Vera (2007).

the BACI international trade analysis database of the Centre for International Prospective Studies and Information (CEPII), at the highest level of product disaggregation available for international comparison (six digits of the Harmonized Commodity Description and Coding System).[32]

First, the quality positioning of Latin American exports is compared with those from developed countries and from the region's main developing competitors (especially China and developing Asian economies) (see figure III.6). The analysis is carried out for the five categories established by Lall (2000), on the basis of the technological intensity of exports: primary products (PP), resource-based manufactures (RBM), low-technology manufactures (LT), medium-technology manufactures (MT) and high-technology manufactures (HT). As stated in chapter II, section 3, the proportion represented by a given category within the export basket of the region's countries varies enormously, and it is therefore useful to carry out a more disaggregated level of analysis to observe performance in terms of quality. Furthermore, the possibility of undertaking vertical differentiation processes could be greater for goods with a higher technology content than for primary products and their manufactures.

A comparison between the region and developed countries shows considerable differences in prices, which can be more than 100% higher in the latter (see figure III.6). The region is at more of a price disadvantage in terms of low-, medium- and high-technology manufactures (50%, on average) than in terms of primary products and resource-based manufactures (20%).

The area in which the region shows the largest gap is in the quality of goods with higher technological content, which offer greater possibilities of quality differentiation. Interestingly, however, there is a 9% gap in terms of primary goods and a 27% gap in terms of resource-based manufactures, exports of which represent over two thirds of the total external sales of South American countries.[33] This means there is a vital opportunity to increase the quality of those exports. Even for these categories of goods, that could be expected to provide less scope for product differentiation, the possibilities are considerable.[34]

The comparison with some developing countries (see figure III.6) suggests that, across all technological categories, the quality of the region's exports is similar to that of developing Asia and other emerging countries. The comparison also indicates that the quality of the region's products is similar to that of China in the case of primary products and natural-resource based manufactures, but higher than China's in terms of medium- and high-technology manufactures. This points to the fact that China might be supplying lower-quality market niches, and would therefore not be competing directly with Latin America (and Mexico in particular) in medium- and high-technology manufactures.

To verify this hypothesis, the export structures of China and Latin America were then compared. At first glance, the two regions appear to be competing in the same products. However, a more disaggregated analysis suggests that competition is less intense than originally assumed, with each region or country specializing in different varieties of a same product. For instance, although China and Mexico both export television sets, Mexican televisions cost more, which means that the exports are of a higher quality. Furthermore, an analysis of the share of both countries in United States imports (the market in which competition between them is strong for such goods), shows that

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32 A mechanism that harmonizes the mirrored trade flows recorded in the United Nations Commodity Trade Database (COMTRADE) and the BACI database of CEPII is used to estimate the unit value of imports in fob terms equivalent to export unit values. The database contains data on 240 countries and 5,000 products from 1995 to 2004, at a six-digit level of disaggregation (Harmonized Commodity Description and Coding System). For further information, see the CEPII website [online] http://www.cepii.fr/anglaisgraph/bdd/baci.htm.

33 In addition, the larger price differences for manufactures (of low, medium and high technology) compared with natural-resource-based manufactures may be due not only to the fact that manufactures offer, in practice, larger margins for adding value and knowledge, but also to a purely statistical factor that may distort results. Insufficient disaggregation at item level becomes more marked as the technological content of goods increases. In this sense, within high-technology goods, the prices of what are essentially different products are probably being compared, even though they have been assigned the same six-digit classification. The relative homogeneity among primary products means that this is less likely to happen in the primary categories.

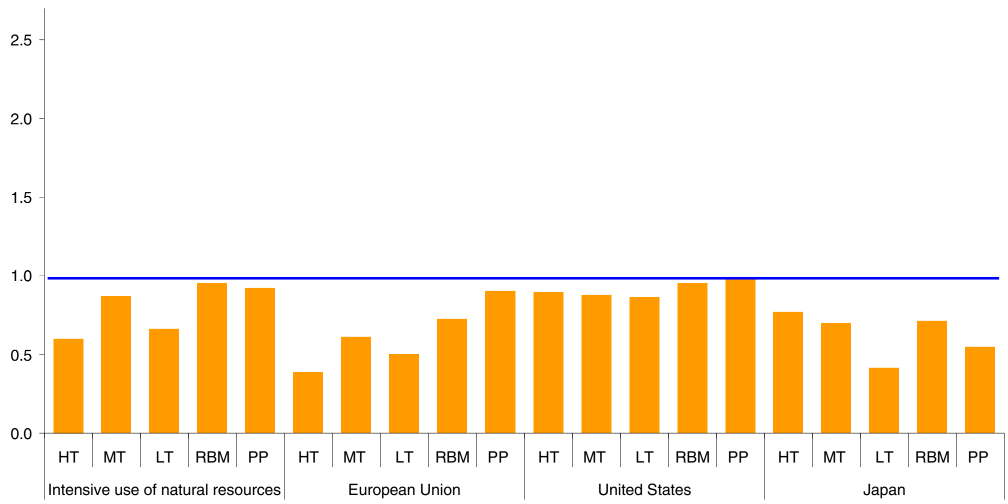
34 These results generally confirm the findings of Machinea and Vera (2007) in the case of some natural-resource-based and low-technology manufactures.

China has increased its market share mainly at the expense of countries from outside the region, and only to a much lesser extent at the expense of Latin American countries (and Mexico in particular) (see box III.2) (Paillacar, Zignago and Mulder, 2008).

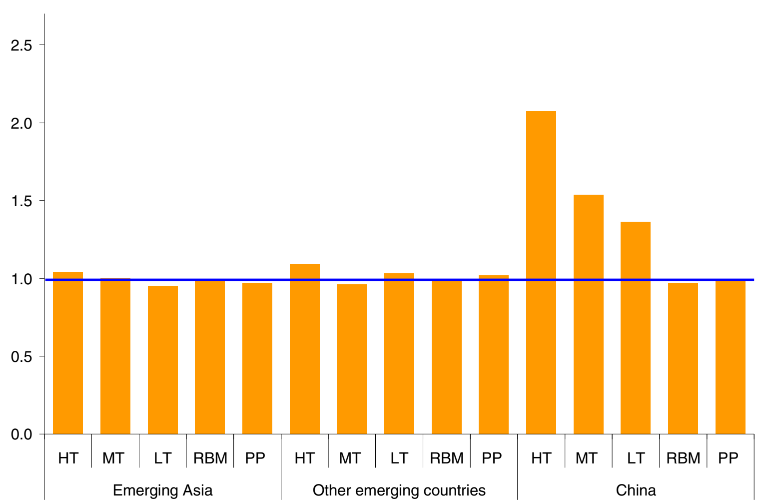
Figure III.6

UNIT VALUES AND QUALITY OF EXPORTS BY CATEGORY OF TECHNOLOGICAL INTENSITY, 2004 [a]

(a) Ratio of unit value of exports from Latin America and the Caribbean to that of the developed countries



(b) Ratio of unit value of exports from Latin America and the Caribbean to that of the emerging countries



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of information from the Centre for International Prospective Studies and Information (CEPII), BACI international trade analysis database.

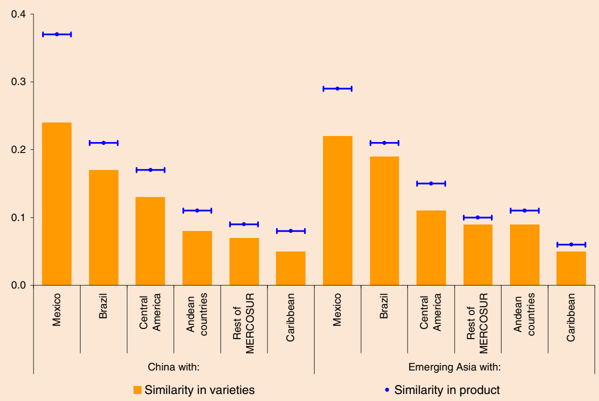
[a] The categories used include the following countries: "Intensive use of natural resources" covers Australia, Canada and New Zealand; "Emerging Asia" refers to the Philippines, Indonesia, Republic of Korea, Singapore, Thailand and Viet Nam; and "Other emerging countries" corresponds to the remainder of developing countries (except India). In the figures themselves, each bar represents the ratio between the median export unit values. For instance, the first bar of the figure (a) shows that, in 2004, the unit value of high-technology exports from countries that make intensive use of natural resources was almost double the unit value of exports of such goods from Latin America.

Box III.2
COMPETITION FOR PRODUCTS AND VARIETIES: THE CASES OF CHINA AND MEXICO

Competition between China and Mexico is lower for different varieties of one product, than for the product as a whole. Variety competition is measured using the similarity index of varieties (quality categories), while product competition is measured using the product similarity index. The export-structure similarity index is calculated as one minus the sum of the absolute values of the differences between the share of each product or variety (i.e., a quality category or product) in total exports (Fontagné, Gaulier and Zignago, 2007). These indices compare the export structures of two countries, with a value of between 0 and 1 (with a higher value indicating greater similarity and therefore greater competition).

The information in the figures below suggests that the similarity index for products from China and Mexico is the highest in the region, as both countries' exports are dominated by the same medium- and high-technology products. However, a more disaggregated comparison of their export structures, one based on varieties, shows a lower similarity index with China, which suggests that the latter is specializing in quality categories (varieties) of medium- and high-technology different from those observed in Mexico.[a]

INTENSITY OF COMPETITION BETWEEN THE REGION, CHINA AND EMERGING ASIA, MEASURED BY THE SIMILARITY OF EXPORT PRODUCTS AND VARIETIES, 2004



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of the Centre for International Prospective Studies and Information (CEPII), BACI international trade analysis database.

Note: Each bar represents the similarity of export structures between the two countries by: (i) products, and (ii) varieties, which is where product meets category of quality. The higher the indicator, the more intense the competition.

From 1995, China and Mexico increased their share of medium- and high-technology imports in the United States market. In the more recent period (2001-2007), the strong increase in China's has not pushed out Mexico, as the latter's share in these products has remained relatively stable in the face of Chinese competition. The explanation is partly to do with the fact that the two countries seem to be competing in different quality categories.

However, these differences in specialization do not depend solely on each country's capacities, but also on the strategic decisions of multinational corporations. Although Mexico has a static comparative advantage due to its proximity to the United States market, China's investment in R&D and human resources should not be ignored. The situation of limited Chinese competition in certain merchandise sectors could rapidly change unless the region's countries carry out similar investments of their own.

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

[a] The competition intensity of emerging Asia with other countries and subregions is similar to that of China (except in the case of Mexico).

(b) Export trends in terms of product quality

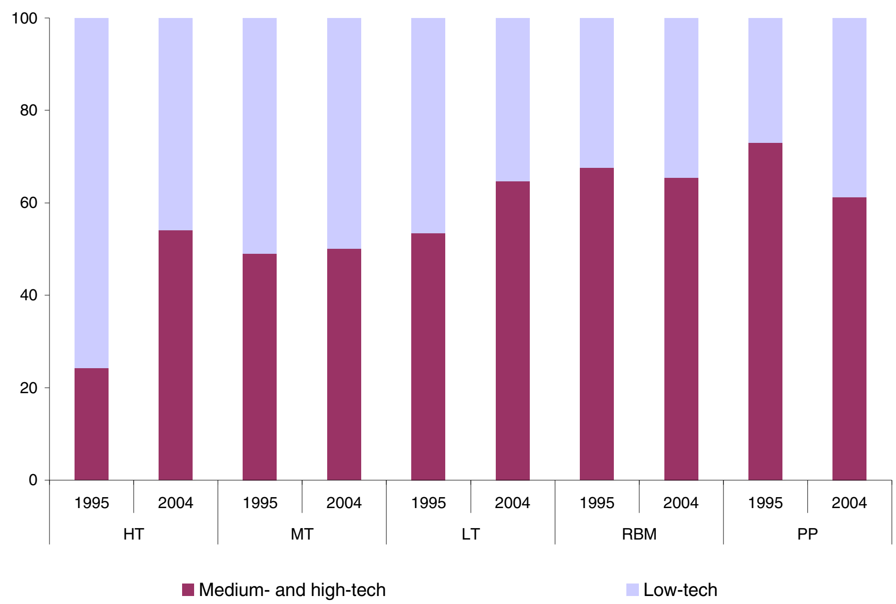
To analyse the region's performance in improving the quality of its exports, the three categories of low, medium and high quality are examined to compare the share of each in Latin American exports between 1995 and 2004. Unit values are used for the three quality categories. If a given country is exporting a product at a lower unit value than the average unit value of all exporters of that product, we can conclude that the export is low quality, and vice versa.[35]

Figure III.7 shows the composition in terms of quality of the region's total exports in each technological category. During the period in question (1995-2004), the region managed to improve the quality of a significant portion of its exports: the proportion of medium- and high-quality exports rose, and the proportion of low-quality exports fell in each category (except in primary products and resource-based manufactures).[36]

Figure III.7

LATIN AMERICA AND THE CARIBBEAN: EXPORTS FROM EACH QUALITY SEGMENT AS A PROPORTION OF TOTAL EXPORTS, BY TECHNOLOGICAL CATEGORY, 1995 AND 2004 [a]

(Percentages)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of information from the Centre for International Prospective Studies and Information (CEPII), world database for international trade analysis (BACI).

[a] The figure is intended to be read as follows: the first two bars, for example, show that the proportion of medium- and high-quality exports in the region's total high-technology exports rose from 24% to 54% between 1995 to 2004.

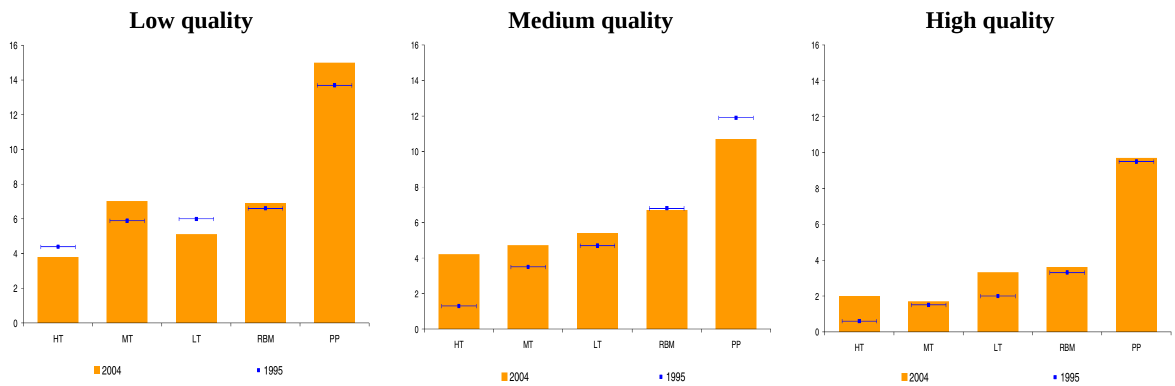
It is apparent that, overall, the region improved the quality of its manufactures (except those based on natural resources). It now remains to be seen how the share of the different quality segments in world trade changed over the same period. This information is presented in Figure III.8, which shows that Latin America and the Caribbean's share in the world trade in medium- and high-quality goods increased and that increases in market share were recorded by exports in the following specific categories: (i) high-technology medium-quality goods; (ii) high-technology high-

[35] A smoothed function is applied based on unit values, so that a quality category (low, medium or high) can be assigned to each trade flow (to six digits of the Harmonized System). This is carried out in two stages: (i) attribution of each flow to a group based on its unit value (in terms of geometric world averages, a below-average unit value is classified as low-medium quality, while an above-average unit value is classified as medium-high); (ii) each group is subdivided into two subgroups (low and medium and medium and high, respectively). This subdivision is carried out using the smoothed function, which assesses the distance of the unit value of the flow from the world average: the further the unit value is from the world average, the smaller the proportion of the flow to be classified as medium. For further details, see Fontagné, Gaulier and Zignago (2007).

[36] The changes in the composition of Latin American exports in terms of quality were quite dramatic in certain international markets. The proportion of high-quality, high-technology and low-technology exports to the United States and high-quality, low-technology exports to Japan mushroomed, while the proportion of medium-quality exports to all destinations in the case of primary products and resource-based manufactures shrank.

quality goods; and (iii) low-technology high-quality goods. The market share of these three segments in world trade also increased.

Figure III.8
LATIN AMERICA AND THE CARIBBEAN: SHARE IN WORLD TRADE, BY TECHNOLOGICAL CATEGORY AND QUALITY SEGMENT, 1995 AND 2004 [a]
(Percentages)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of information from the Centre for International Prospective Studies and Information (CEPII), world database for international trade analysis (BACI).

[a] The figure is intended to be read as follows: Latin America and the Caribbean's share in the world market for high-quality high-technology (HT) products, for example, increased from 0.6% in 1995 to 2% in 2004. The proportion of high-quality high-technology products in world trade rose from 7.1% to 8.1% over the same period.

The region's gains in terms of its share in the world trade of high-technology goods (in the medium- and high-quality segments) warrants closer analysis, however. First, one country (Mexico) accounts for almost three quarters of the region's increase in market share. Second, in 1993-2006, a similar proportion (76%) of Mexico's manufactured goods were produced by maquila operations or under temporary import schemes. Under these modes of production, foreign trade indicators tend to account for inputs twice (because they are re-exported) and therefore do not necessarily represent local value added.

The rapid growth of Mexican exports to the United States can be attributed to the entry into force of the North American Free Trade Agreement (NAFTA) in 1994, which drove up investment by transnational corporations in the automotive, autoparts and electronics industries. Although the goods produced by these industries are medium- and high-technology items, the production activities in Mexico revolve mainly around the more labour-intensive links in the chain that make less use of knowledge, design and R&D (see a more detailed analysis of the maquila industry in chapter V). Even without making notable improvements in labour productivity, Mexico's production under these kinds of export promotion schemes, however, has become highly competitive. The sector has an enormous capacity for export and expansion and for producing more complex and even technology-intensive goods. The value added by technology and improved organizational capacity is not local, however, and cannot therefore be accounted for as such.

Although Latin America and the Caribbean accounts for the largest proportion of international trade in primary products (PP) in each quality segment, the trends observed between 1995 and 2004 are not encouraging. The region gained ground in the low-quality segment, lost ground in the medium-quality segment and maintained its position in the high-quality segment.[37] The results at the country level varied. Brazil, for example, gained ground in the world trade of

[37] Between 2003 and 2006, however, robust economic growth in Latin America and the Caribbean meant that the region's share in the world trade in primary products and resource-based manufactures rose from 8.5% to 10.2% according to data obtained from COMTRADE.

high-quality primary products, while the rest of MERCOSUR and the Andean countries lost part of their market share. In the same period, Mexico and Central America saw their share in the world trade in medium-quality primary products fall.

(c) Upgrading exports: improving quality and increasing market share

The region's performance in terms of improving the quality of its exports and its position in the world market were analysed in the preceding section. The region should be aiming, however, to enhance product quality with a view to charging higher prices than the competition and capturing a larger share of the market. Boosting competitiveness in this way is referred to as the upgrading of exports. Conversely, lowering the relative price of the product and losing market share can be considered the downgrading of exports. The other two possible combinations of events are more difficult to classify because the outcome depends on the degree of the increase (or decrease) in the relative price and the extent of the loss (or gain) in market share.

Table III.5
EXPORTS: UPGRADING AND DOWNGRADING MATRIX

		Market share	
		Loss	**Gain**
Relative unit value (compared to market average)	Increases	Ambiguous	Upgrading
	Decreases	Downgrading	Ambiguous

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

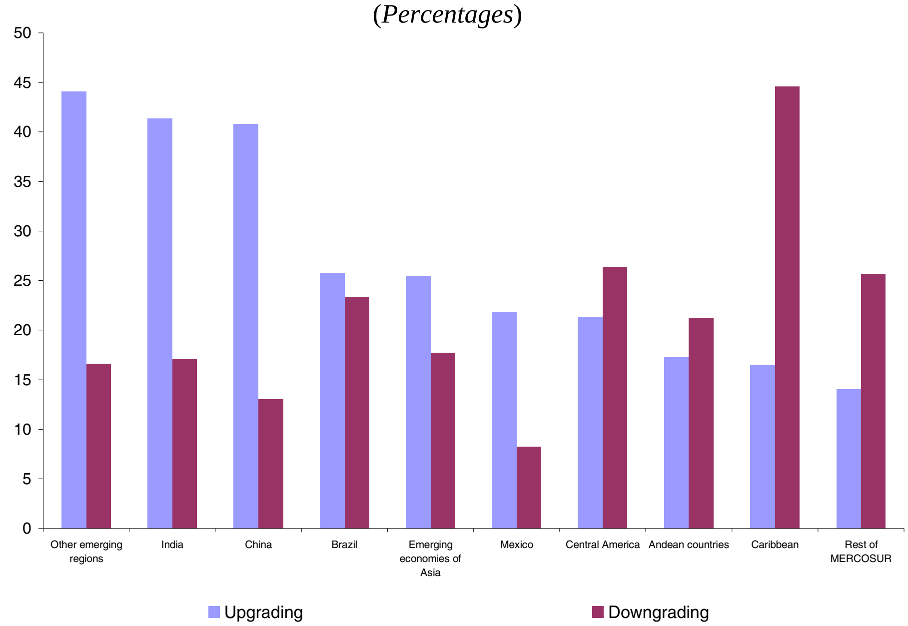
This section examines the extent to which Latin America and the Caribbean and other emerging areas upgraded or downgraded their exports in two subperiods:1995-1999 and 2000-2004.

The progress made by the countries of Latin America and the Caribbean in 2000-2004 (see figure III.9) was minimal: the best performances were recorded by Brazil and Mexico, which upgraded 26% and 22% of their total exports, respectively. Mexico also recorded the lowest percentage of export downgrading, and its good performance overall is reflected in the aforementioned gains in market share in the medium- and high-quality segments. The Caribbean countries suffered the worst downgrading (45%), followed by Central America and the rest of MERCOSUR. In both cases, the downgrading occurred in the textiles and apparel sector, where Latin America and Caribbean countries are being pushed out of the United States market by China and other Asian countries. The results for this subperiod confirm the trend witnessed in the preceding five-year period (1995-1999), at least as regards the upgrading process in Brazil and Mexico.[38]

A more detailed analysis of the situation at the individual market level reveals some peculiarities. Although 42% of Mexico’s exports to the European Union suffered a downgrading between 2000 and 2004, 20% of them recorded an upgrading in the United States market. Brazil managed to upgrade its exports to both of these markets, but the upgrading of its intraregional exports was far less impressive. A significant portion of the exports from the Caribbean to both the European Union and the United States suffered downgrading. The Andean countries, meanwhile, recorded the highest level of upgrading in the European market and the lowest level of upgrading in the United States market.

[38] During this period, however, the performance of the Caribbean, Central America and the Andean countries improved notably thanks to growing demand in the United States, the weaker competition then posed by China (prior to its incorporation into the World Trade Organization (WTO)), and the limited ability of other Asian countries to compete in the wake of the serious financial crisis that affected them in the 1990s.

Figure III.9
UPGRADING AND DOWNGRADING, AS A PROPORTION OF TOTAL EXPORTS FROM LATIN AMERICA AND THE CARIBBEAN AND OTHER EMERGING REGIONS, 2000-2004 [a]
(*Percentages*)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of information from the Centre for International Prospective Studies and Information (CEPII), world database for international trade analysis (BACI).

[a] For example, the first bar corresponding to "Other emerging regions" indicates that this group increased both the relative unit value of its exports (compared to the market average) and the market share of 44% of its exports in 2000-2004 (upgrading). The second bar shows that in the same period, 17% of its exports suffered a decrease in their unit value (compared to the competition) and a loss of market share (downgrading). The percentages correspond to exports for which unit values can be calculated.

The analysis suggests that the progress the region has made in upgrading the quality of its exports has been mixed. There is still an enormous gap between the quality of the region's exports and the quality of exports from advanced countries, and although the gap is smaller in the case of commodities than in medium- and high-technology manufactured goods, the region has plenty of room for improving the quality of its products, including its primary product exports. Interestingly, Latin America and the Caribbean (and Mexico in particular) produce medium- and high-technology products of apparently superior quality to those exported by China and does not, therefore, have to compete directly with China in the same quality segments. The region has also managed to increase its share in the world trade of those products. The analysis of export upgrading, however, shows that compared to Latin America and the Caribbean, China has made much faster progress in increasing the price of its products with respect to the average price of its competitors and in simultaneously increasing its share in world markets. Moreover, thanks to heavy investment, dynamic innovation and intensive human resources training (Wang and Wei, 2008; Li and others, 2008), China is likely to be in a position to rapidly increase its competitiveness in medium- and high-technology sectors unless the countries of the region manage to take similar action.

2. Learning and quality in the natural-resources sector: agriculture

The preceding section showed that, in the case of primary products and resource-based manufactures, the region has not made much progress in quality upgrading. Considering the importance of these sectors to the economies of Latin America and the Caribbean (ECLAC, 2005 and 2007f), this section will provide a more detailed analysis of the situation of the agricultural sector in the region, which accounts for about 15% of the goods (excluding fishery products) exported by the region as a whole and 19% of South America's goods exports.

One way to upgrade exports (not only in the agricultural sector and agro-industry) is to gain a foothold in more sophisticated markets at the domestic and international level. Penetrating markets of this kind means linking up with a new value chain, which usually involves different stakeholders and interactions and means handling new demands regarding the products sold and the inputs used in their production, whether these be primary or differentiated goods. Within Latin America and the Caribbean, moving into the domestic sophisticated food items market means selling to supermarkets rather than to the small businesses and shops that make up traditional markets. At the international level, it generally means breaking into the developed countries' markets for imported goods (Hallak, 2006; Lall, Weiss and Zhang, 2005).

Consumers and firms in the sophisticated markets are willing to pay a premium for farm produce that, beyond the (generally public) minimum quality and safety standards, meets the private requirements and specific demands of certain segments of the population (the so-called market niches). Producers who manage to gain a foothold in these markets can benefit from rising demand and competition that is often based not so much on price wars as on the distinctiveness of the product.

Upgrading in these markets does not necessarily mean increasing the industrial processing of a product. In most production chains (e.g. meat, dairy products, grains, sugar, oil-seed, tobacco, textile fibres), products that involve the highest level of industrial processing are the ones that enable the producer to move further along the chain and closer to the final consumer and thus capture more of the price margin. The opposite is true in fruit and vegetable chains, however. In these, fresh products are becomingly increasingly valued over processed ones as a result of the healthy-eating drive among high-income segments of the world's population (Wilkinson, 1998) and the fact that getting a fresh product in optimum organoleptic conditions to the final consumer is often more complex than dispatching a processed one. Value added, in these cases, is not derived from the industrial processing of the farm produce, but from the services associated with the preservation and distribution of the fresh product with all the characteristics sought by the consumer.

The question then is how can Latin American and Caribbean agricultural producers penetrate more sophisticated markets and to what extent can they benefit from differentiated prices in higher value added products (as approximated by price)? In order to answer this question, the region's penetration of developed markets in terms of specialization and market share will be analysed first. Subsequently the price levels at which this occurs will be determined.

(a) Demand and quality by market

An indicator of revealed comparative advantages (SP) was used to measure and compare the specialization of the region's countries with that of certain countries of reference (Australia and New Zealand) in the most demanding import markets (European Union, United States and Japan).[39] Table III.6 presents the SP per import market for four groups of agricultural products classified according to their level of processing: primary products, intermediate products, final products and inputs.[40] The table shows that few countries in the region are relatively specialized in exporting to

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[39] The indicator is similar to Balassa's specialization or revealed comparative advantage indicator, but applied to destination markets as follows:

$$SP = (Xijk/Mjk) / (Xik/Mk)$$

In the formula, *X* are exports, *M* imports, *i* the country of origin, *j* the destination country and *k* the product. Basically, the indicator shows the ratio between market share in the importing country (in this case, the United States, Europe and Japan) and share in the world market, for a given exporting country (Latin America, the Caribbean, Australia and New Zealand in this exercise) and a given product (agricultural products classified according to their level of processing, plus agricultural inputs, up to six digits of the Harmonized Commodity Description and Coding System).

[40] Agricultural products were classified according to their level of industrial processing into primary products, intermediate products and final consumer products, using the criteria established in the database of the WITS-TRAINS (World Integrated Trade Solutions-Trade Analysis and Information System of the United Nations Conference on Trade and Development (UNCTAD) and the World

developed country markets (SP >1) and most of them only supply them with primary agricultural products. The pattern is similar for the countries of reference, Australia and New Zealand.

Table III.6
INDICATORS OF SPECIALIZATION IN IMPORT MARKETS OF DEVELOPED COUNTRIES (SP) [a]

	Primary agricultural products		Intermediate agricultural products		Final agricultural products		Inputs	
	1991-1993	2004-2006	1991-1993	2004-2006	1991-1993	2004-2006	1991-1993	2004-2006
Mexico	1.26	1.21	1.25	1.08	1.23	1.07	1.42	1.07
Ecuador	1.10	1.12	1.13	0.47	1.03	0.93	0.09	0.22
Peru	1.00	1.11	0.72	0.84	1.22	0.83	0.25	0.62
Colombia	1.15	1.02	0.74	0.61	1.06	0.79	0.19	0.32
Australia	0.65	0.46	0.25	0.25	0.52	0.70	0.51	0.29
Chile	0.93	0.87	0.55	0.30	0.63	0.67	1.10	0.78
Costa Rica	-	1.20	-	0.48	-	0.61	-	0.96
Brazil	1.01	0.76	1.13	0.76	0.91	0.60	0.36	0.21
Venezuela (Bol. Rep. of)	-	0.73	-	0.87	-	0.55	-	0.65
Argentina	0.65	0.38	0.79	0.54	0.77	0.50	0.63	0.19
New Zealand	0.83	0.83	0.47	0.35	0.66	0.49	0.76	0.53
Nicaragua	0.95	0.82	1.30	0.65	0.56	0.38	0.12	0.06
Honduras	-	1.16	-	0.60	-	0.30	-	0.83
Paraguay	0.53	0.27	0.86	0.16	0.30	0.29	0.22	0.06
Uruguay	-	0.79	-	0.06	-	0.25	-	0.08
Panama	-	1.15	-	0.98	-	0.22	-	0.02
El Salvador	-	1.11	-	1.04	-	0.19	-	0.25
Trinidad and Tobago	0.65	0.47	1.11	1.11	0.28	0.16	0.98	1.16
Guatemala	1.21	1.11	0.96	0.46	0.23	0.14	1.20	0.74
Bolivia	0.51	0.79	0.05	0.09	0.14	0.06	0.26	0.38

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of United Nations Commodity Trade Database (COMTRADE).

[a] The countries are presented in descending order by indicator of specialization for final agricultural products in 2004-2006. The figures highlighted in yellow refer to products and countries whose share in developed markets has increased. It should be borne in mind that no comparison can be made in the cases in which data are not available for both periods under consideration.

Several factors may account for the meagre specialization in developed country markets. First, tariff and non-tariff barriers in the three import markets in question are high for agricultural and agro-industrial goods, which restricts imports in those countries. Second, for Latin America, and Australia and New Zealand as well, the geographical distance of the markets (except the United States market for some of the region's countries) has an impact on results (Kjöllerström, 2004; Carrère and Schiff, 2003).

The problem may also be, however, that the quality and safety standards for farm produce demanded by consumers in these more sophisticated markets are not being incorporated into the production techniques of Latin American countries. [41] In many cases, this may be due to a lack of human resources and technological, institutional or financial capital to produce these kinds of products, as well as inadequate integration into large marketing chains. The region's countries need to make an effort in the medium and long term to improve the quality of their exports.

Bank. Meat and edible meat offal (chapter 02 of the Harmonized System) and fresh, refrigerated and frozen meat (on or off the bone) are considered primary products, while processed meat (salted, dried or smoked) is classified as an intermediate product, and prepared meat and meat cuts (listed in chapter 16) are classified as final consumer products. Agricultural inputs include agrochemicals (several headings of chapters 25, 28 and 31), farm machinery (several headings of chapters 82, 84 and 87) and other inputs, such as seeds and cuttings (provided they are identified in the agricultural goods chapters, i.e. in chapters 01 to 24).

[41] In the period under consideration, the international food market was affected by various disease outbreaks (from bovine spongiform encephalopathy to avian flu) in nearly every region, which forced countries that export farm produce to impose tighter controls and higher quality standards.

The evolution of the specialization indicator shows that the relative presence of most of the countries and their products in the developed country markets was down in 2004-2006 compared with 1991-1993. A drop in the SP indicator could, of course, represent either a decrease in the proportion of exports to those markets or an increase in exports to other destinations. In the past 15 years, there has been a huge rise in demand for agricultural produce in the emerging Asian countries, and especially in China. The robust growth of exports to Asia tends to reduce specialization in the traditional markets of the more advanced countries but would not necessarily reduce market shares there.

It is therefore of particular interest to determine whether the reduction in the indicator of specialization was accompanied by a loss of market share in the developed countries. In most of the cases for which data are available for both periods (70% of the countries), the decline in specialization indeed coincides with a loss of market share in the developed countries.[42] Only one third of the countries (highlighted in yellow in table III.6) recorded an increase in their presence in these markets. The most notable cases are Brazil, Chile, Mexico and Nicaragua, whose market shares increased in two of the four product categories.

The combined occurrence of the two factors, a lower level of specialization and a smaller share in developed country markets, is worrying. It could be argued that any decline in specialization in developed markets, even if it is accompanied by an increase in market share, is cause for concern as it implies that the economy in question is specializing in exporting relatively lower-quality goods to developing countries. The goods exported to developing countries, however, often incorporate innovative production or management processes that generate improvements in productivity and other externalities associated with technical progress.[43]

Thanks to recent improvements in the processing of primary agricultural products, farming is gradually beginning to incorporate new non-traditional objectives into the traditional goal of increasing yields and the area under cultivation, such as ensuring the sustainability of natural resources and reducing the environmental impact of expanding production.

(b) Unit prices and market niches

As mentioned in the section above, the unit value is used in international trade as an indicator of the quality of the products traded. This indicator is used below to assess the extent to which the countries of the region succeed in applying vertical differentiation in terms of the quality of agricultural products exported to more sophisticated import markets, where, supposedly, there is more scope for this type of strategy.

In order to carry out this exercise, import unit values for the group of developed countries (United States, European Union and Japan) are used, and the relative unit value of imports (RUV)[44] is calculated between the countries of Latin America and the Caribbean (plus reference countries, Australia and New Zealand) and all those that export towards those markets.[45] The results by the group of competitors are checked by calculating next the RUV in relation to a group of developed countries (the European countries, United States, Canada, Australia, New Zealand and Japan).

For their overall exports of agricultural products and inputs, the Latin American countries suffer a price disadvantage of almost 10% compared with their developed competitors (RUV DC) (see figure III.10). However, Latin American countries have a slight price advantage, although not a

42 The loss of market share was similar in the case of Australia and New Zealand as well.

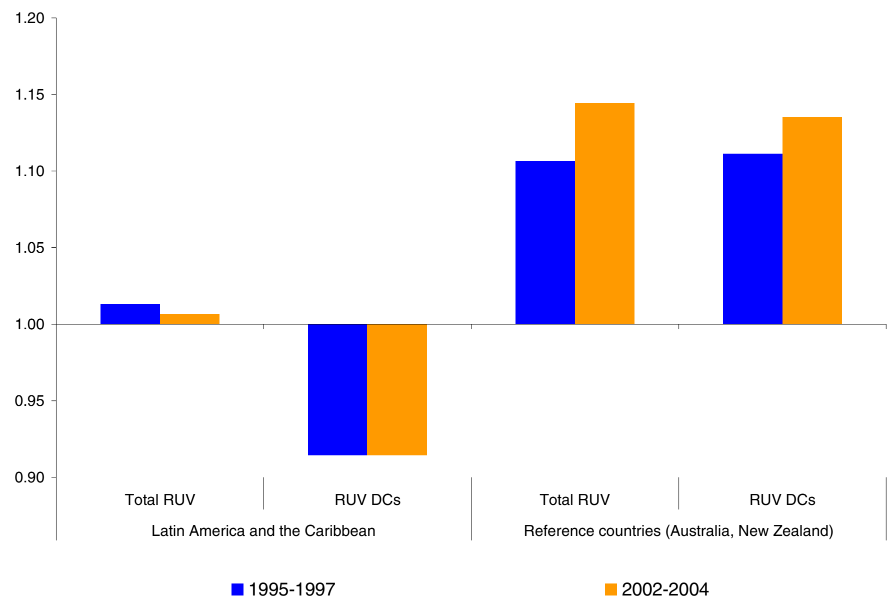
43 This is the case of soybean production, as described in chapter V.

44 In order to exclude, as far as possible, the effect on prices of other variables (differences in product classification by customs officials in the different countries, inclusion of significantly different products under the same trade category, others), the indicator was calculated at the greatest possible level of product disaggregation (six-digit level of the Harmonized System). Aggregation by groups was effected subsequently on the basis of the weighted average (for bilateral trade) of the six-digit RUV values.

45 In the case of the European Union, trade among its member countries is included.

very significant one vis-à-vis total competitors (total RUV). This is consistent with the assumption that a country's level of development has a positive impact on the quality of its exports; by the same token, the advantage of the Latin American countries and reference countries diminishes when competitors of the developed world as a whole are considered separately.

Figure III.10
LATIN AMERICA AND THE CARIBBEAN AND REFERENCE COUNTRIES: RELATIVE UNIT VALUES OF IMPORTS INTO THE MARKETS OF THE DEVELOPED COUNTRIES, [a] 1995-1997 AND 2002-2004
(Weighted average)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of information from the Centre for International Prospective Studies and Information (CEPII), world database for international trade analysis (BACI).

[a] The bars of "total RUV" and "RUV DCs" are obtained by dividing the unit value of exports from Latin America and the Caribbean to the developed countries by the unit value of exports from all countries (total) to the developed countries (DC). For example, the first "total RUV" bar suggests that in the period 1995-1997, the UV of Latin American and Caribbean exports to the developed countries was just 1% higher than the unit value of exports from all countries that exported to these same markets.

The reference countries (Australia and New Zealand) do show a significant price advantage with respect to the total set of competitors (almost 15% in 2002-2004), which continues to be positive and of almost equal magnitude in comparison with the group of developed country competitors. The worrying thing is that in recent years, these countries succeeded in increasing the positive differential in the prices of their products, causing the gap with Latin America and the Caribbean as a whole to widen.[46]

The openness of the indicator by countries shows that the aggregate values conceal a series of important nuances. Indeed, figure III.11 shows that 10 Latin American countries have unit export price advantages of over 10% over their competitors as a whole. The lack of major differences in the prices corresponding to the aggregate (see figure III.10) is due to the fact that the countries with the highest weighting in the weighted average (especially Brazil and Mexico) obtain lower prices than their competitors for their exports of agricultural products.

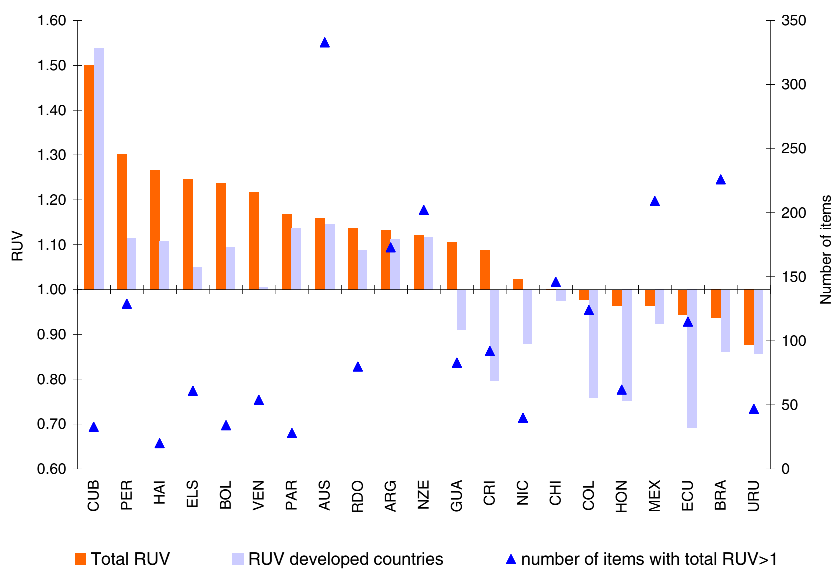
[46] Australia and New Zealand's price advantage over Latin America and the Caribbean is lower if the set of primary products and resource-based manufactures are taken into consideration (preceding section), than it is if only agricultural products are examined, as in this section.

When the competition of the developed countries only is taken into account, the price advantages diminish (and sometimes practically disappear) just as they do at the aggregate level. Cuba offers an interesting example, since its performance compared with developed competitors is better than its performance compared with all competitors. This is due basically to the differentiation in derivatives of tobacco, a product in which other developing countries are its main competitors in terms of quality.

The information on the number of items marketed with RUV>1 as illustrated by figure III.11 is useful for relativizing some of these results. In contrast with the Australia and New Zealand, most Latin American and Caribbean countries that achieve a price advantage (including Cuba, which shows the highest percentage advantages) have a fairly limited number of products in this situation.[47]

Figure III.11

LATIN AMERICA AND THE CARIBBEAN AND REFERENCE COUNTRIES: RELATIVE UNIT VALUES OF IMPORTS BY COUNTRIES IN DEVELOPED COUNTRY MARKETS, 2002-2004 [a b]



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of information from the Centre for International Prospective Studies and Information (CEPII), world database for international trade analysis (BACI).

[a] The countries are presented by order of the number of marketed items.

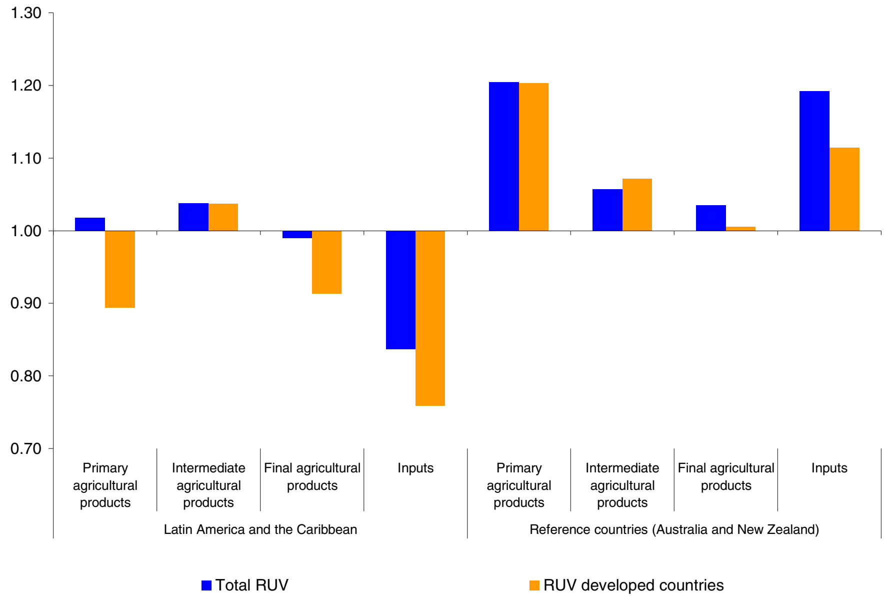
[b] For example, for the first country of the figure (Cuba), the first bar indicates that the unit value of exports to developed countries was 50% greater than the unit value of exports from all countries that exported to the same markets.

When the previously defined product categories are examined, the region can be seen to suffer a price disadvantage vis-à-vis developed country competitors in the categories of primary products, final consumption and, first and foremost, agricultural inputs (see figure III.12). In the last two, the region's exports to the developed countries are lower than the average for all competitors.

[47] It is important to consider the number of items with positive price differentials, as this shows the scope and limitations of countries' vertical differentiation strategies. Owing to the way in which the trade categories are organized in the Harmonized System, the number of products reflects the chains that benefit directly from the price gain and, among these chains, the type of product in which the country manages to excel (primary products, partially processed products or manufactures). The further a country goes in its differentiation strategy, the broader and more diversified its activities and services associated with the export-quality-based differentiation will be. Such diversification is a source of positive externalities for the economy and, in particular, has a positive impact on the country's capacity to continue pushing ahead its vertical differentiation strategy by incorporating new products and chains. It must be recalled, however, that the number of items also depends on the relative size of each country and, in this particular case, on the importance of the agricultural sector in each individual country.

Figure III.12

LATIN AMERICA AND THE CARIBBEAN AND REFERENCE COUNTRIES: RELATIVE UNIT VALUES OF IMPORTS OF DIFFERENT PRODUCT CATEGORIES IN THE MARKETS OF DEVELOPED COUNTRIES, 2002-2004[a]



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of information from the Centre for International Prospective Studies and Information (CEPII), world database for international trade analysis (BACI).

[a] For example, the first bar of primary agricultural products indicates that the unit value of Latin America and Caribbean exports to the developed countries was 1.5% higher than the unit value of the exports of all the countries that exported to the developed countries.

The relative unit value indicator shows that in differentiation of both primary and processed products the region has lagged behind its developed country competitors and even further behind the reference countries. In the first case, the region fails to avail itself of a series of comparative advantages that exist in relation to the natural resources for differentiation of its primary agricultural production and, in the second, the import of technology currently available could enable it to improve the quality of the agricultural products processed in the region, although this would imply the additional task of achieving the opening up of developed markets to the agricultural products from Latin America and the Caribbean. In both cases, the region may suffer from lack of integration with international chains in the sector, especially in terms of primary and final agricultural products.

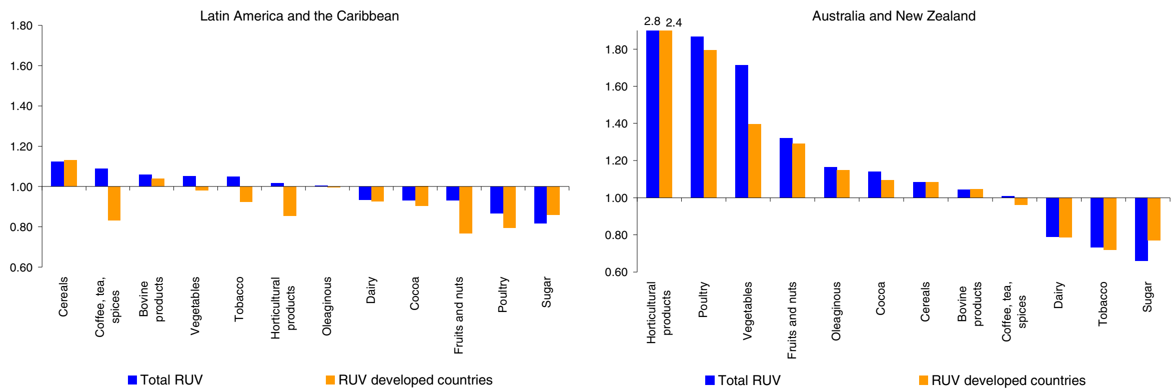
As shown in figure III.13, unlike the situation in Australia and New Zealand, Latin American and Caribbean advantages are concentrated in just a few production chains, basically cereals (rice, cereal meals and starches) and bovine products (meats and offal, but also skins and hides, and live animals).

At this point, examining the inner structure of production chains can be useful for identifying strategic patterns relating to product upgrading, which we referred to above. The importance of innovation in production processes and in marketing is also reflected in product value chains. For example, table III.7 shows some product chains in which the countries of the region present revealed comparative advantages, ranked according to the average world price corresponding to each product (total traded value (US$/total volume (Kg)). These three examples give rise, broadly speaking, to two patterns: first, products with a further degree of processing do not always have a higher price, since innovation can be incorporated into services of other types, such as conservation and transport of fresh products. Second, while the region presents comparative advantages in all the products that comprise these production chains, it tends to specialize more patently in the production of lower-priced goods.

This suggests that in the production of primary goods, there is a wide margin for improving the position of the region within the chain through the shift towards niches with higher unit values.

Figure III.13

LATIN AMERICA AND THE CARIBBEAN AND REFERENCE COUNTRIES: RELATIVE UNIT VALUES OF IMPORTS OF DIFFERENT PRODUCTION CHAINS IN DEVELOPED COUNTRY MARKETS, 2002-2004 [a]



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of information from the Centre for International Prospective Studies and Information (CEPII), world database for international trade analysis (BACI).

[a] For each product, the first bar represents total RUV. In the first case (cereals), the unit value of Latin American and Caribbean exports to the developed countries was 15% higher than the unit value of exports from all countries that exported to the developed country markets.

Table III.7

ANALYSIS OF COMPARATIVE ADVANTAGES AND AVERAGE PRICES OF SOME AGRICULTURAL CHAINS [a]

Grapes (Argentina)	**Comparative advantage**	**Average world price**[b]
Wine of fresh grapes n.c.. incl. fortified wines; grape must. in recipients of less than 2 litres	3.2	3.2
Raisins	6.0	1.2
Grapes. fresh	3.2	1.2
Wine of fresh grapes. alcoholic drinks from grape must n.c.	2.7	0.9
Grape juice or must. unfermented. non-alcoholic	41.6	0.8
Grape must. non-fermented. except as fruit juice	11.0	0.6

Bovine and related products (Brazil)	**Comparative advantage**	**Average world price**
Leather and hides bovine and equine. full grains. unsplit; grain. split. n.c.	6.4	16.2
Other leathers and hides. bovine and equine. n.c.	4.4	13.0
Salted. dried and smoked beef	7.4	6.2
Frozen cow tongues	3.7	5.6
Beef cuts. boneless. fresh. chilled.	7.1	4.6
Bovine leather. non-vegetable pretanned	13.4	3.0
Prepared or preserved salted beef. offal. except liver	28.5	2.9
Beef cuts with bone in. frozen	1.0	2.3
Beef cuts. boneless. frozen	16.2	2.2
Beef carcasses/half-carcasses. frozen	1.4	2.0
Edible offal of bovine animals. except livers and tongues. frozen	9.7	1.4
Skins and hides. bovine and equine. tanned or retanned. n.c.	5.4	1.1
Other fresh or wet-salted bovine hides and skins n.c.	1.2	1.0
Beef livers. frozen	5.6	0.9
Beef. mutton or goat tallow. raw or melted	1.5	0.4

Table III.7 (concluded)

Salmon (Chile)	**Comparative advantage**	**Average world price**
Salmon, smoked, including fillets	13.6	11.1
Salmon, fresh or chilled, whole	6.5	3.7
Salmon, prepared or preserved, not in portions	15.4	3.6
Atlantic or Danube salmon, frozen, whole	58.3	3.2
Pacific salmon, frozen, whole	77.6	2.5

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of information from the Centre for International Prospective Studies and Information (CEPII), world database for international trade analysis (BACI).

[a] The revealed comparative advantage indicator compares the market share of country A for product i with country A's total share of the world market. If the product market share is greater than total market share, the revealed comparative advantage indicator is greater than 1 and country A is said to be specialized in product i. If it is less than 1, then country A is not specialized in product i.

Expressed mathematically, this gives the following equation:

$$RCA = \frac{MS_{Ai}}{MS_A}$$

where RCA is the revealed comparative advantage indicator, *MS Ai* is country A's market share for product *i*, and *MS A* is country A's total market share.

[b] Average prices are expressed in US$ per kilo.

3. Opportunities for differentiation and quality upgrading

In the light of this overall assessment, it may be concluded that the region's performance in terms of vertical differentiation and quality upgrading is mixed. On the one hand, for all goods, the quality of exports is no lower than that recorded by other emerging countries and superior to that of China for medium- and high-technology goods. Moreover, the countries of Latin America and the Caribbean have gained a greater share of the dynamic world trade of medium- and high-quality products. This last achievement must be interpreted with caution, however, since the bulk of the region's performance relates only to Mexico, where these goods are manufactured by in-bond processing companies and, as such, the benefits they generate for the local economy are limited, albeit important in terms of job creation (see chapter V).

Furthermore, the absolute gap between the quality of exports from the region and those from the industrialized countries remains wide and did not narrow during the period 1995-2004. It is also evident that the progress in the region in terms of overall quality improvements and gains in the share of export markets between 2000 and 2004 was much lower than in the case of China, India and the other emerging economies; in fact, they did not match their own level of performance in the five-year period 1995-1999. Lastly, the review shows that the region has continued to lag far behind in terms of quality of all types of products, from natural resources to high-technology goods. This lag can, at the same time, be viewed as an opportunity provided that the region makes innovation gains in the various sectors. These potential capacities are considered in chapter V.

A more thorough analysis of the agricultural complex reveals a similar situation. As a region, Latin America and the Caribbean, has not been capable, in general terms, of following a quality upgrading strategy for agricultural and agro-industrial exports, although in these categories, it enjoys significant comparative advantages. The indicators considered reveal the existence of openings that must be occupied through more active policies; indeed, there are opportunities for differentiation in both primary and processed products that are not being exploited, whereas other countries with similar resource endowments do manage to take advantage of such opportunities. The analysis reveals some important opportunities which the region has forgone and which would have enabled it to make strides within some chains. In some cases, such opportunities arise for fresh products, while in others they exist for processed products.

Thanks to a series of innovations, agriculturalists are now in a position where they can gradually incorporate special features into agricultural products, which up to quite recently were homogeneous. This process, referred to as the *decommoditization* of agriculture, is prompted by the growing sophistication of consumer demand, as well as by the possibilities created by biotechnology (see chapter I), which make it feasible to introduce a range of innovations in traditional primary products.[48]

Nevertheless, product differentiation strategies, whether geared towards the major international markets or the most vibrant domestic markets, call for investment in technological assets and knowledge in fundamental segments of the production chain; such investment is needed in order to meet public and private quality and safety requirements (Reardon and others, 2001), and reduce transport and transaction costs. It goes without saying that it is imperative to advance towards sustainable production from the social and environmental viewpoints, a criterion increasingly demanded by consumers, in many cases, no longer for purposes of differentiation, but rather as an indispensable requirement for participating in the most sophisticated markets. In particular, the State, in conjunction with the private sector, must play a role in promoting these investments if small producers are not to be excluded from the field of possibilities opened up by the new dynamic of food consumption (see, for example, Hartwich, González and Vieira, 2005; Salcedo, Rodrigues and Dirven, 2007). Since the agricultural sector in Latin America is so disparate and since rural producers differ in terms of their capital stock and technological capacities, it may be very difficult to foster the adoption of more advanced technologies among those that do not have access to the necessary capital of any kind (Dirven, 2007; Cap and González, 2004).

The diversification of export supply leads to challenges in terms of technological and commercial policies that are not insignificant (Gutman and Lavarello, 2007). The margin for manoeuvre of the Latin American and Caribbean economies is constrained, on the one hand, by the agricultural policies of the developed countries, with their high levels of protectionism and subsidies, and, on the other, by the policy of the Asian countries, which encourages the import of unprocessed goods and pressures countries to produce at a rate that can jeopardize the future sustainability of some primary products. It should also be borne in mind, that, as in other sectors, exports and domestic and external distribution are often controlled by large firms that operate globally and whose influence as stakeholders has been growing steadily (see chapter I). These are the difficulties which, while they do not prevent the establishment of development policies based on the advantages of the agri-food sector, make such policies increasingly difficult to apply.

[48] In turn, these process innovations generate differentiated products, which generally are not reflected in international trade statistics, since the share of the export niches is limited compared with the share enjoyed by traditional primary goods.

Chapter IV

Techno-economic paradigms: ICTs and biotechnology

A technological paradigm involves the gradual creation of innovation opportunities measurable by changes in the basic technical characteristics of the “artefact(s)” concerned. For example, advances in the technical and physical characteristics of semi-conductors, microprocessors, hard disk units, storage systems and graphic and visual devices determine the main parameters for the development and diffusion of the ICT paradigm. In the case of biotechnology, advances —even embryonic and intangible— in the sequencing of genomes, genes and DNA, the analysis and modification of genetic material and the synthesis and modification of DNA indicate that we are experiencing a new technological revolution.[1]

The concept of the technological paradigm is matched by the broader concept of the “techno-economic” regime or paradigm, which encompasses the interaction between technological change and economic development. Changes in techno-economic paradigms may be said to redefine the trajectory not only of the technological and economic spheres but also of the social sphere (Pérez, 2008). In order for innovation of this type to exist, some conditions need to converge, such as ample and low-cost availability of a key input (for example, oil during the metal/mechanical paradigm and chips and semi-conductors in the information technology paradigm), possibility of using the new

[1] Various concepts exist to describe innovative activities: paradigms, regimes, trajectories, salient features, indicators, dominant technological designs, general-purpose technologies. All try to reflect the common features of technical change and their complementarity with other economic, social and institutional factors (Cimoli and Dosi, 1995).

technologies in a broad range of sectors (pervasiveness) and adjustment in the social and institutional context so that barriers to innovation can be removed and the new paradigm can be diffused. As will be seen below, this process is happening in the case of ICTs and still embryonic in biotechnology.

The effects of a particular techno-economic paradigm most faithfully represent Schumpeter's idea of "creative destruction" (mentioned in chapter I), capable of sustaining a lengthy growth cycle resulting from the emergence, disappearance and reconfiguration of the various sectors. The way in which each country reacts to these effects largely determines whether it succeeds and is able to keep pace with the growth of the world economy. As will be seen below, situations are more fluid and the institutional context in each country has a considerable influence on the speed with which the new paradigm is absorbed. In this connection, the degree to which public policy is geared to consolidating the system of science and technology by enhancing the research and development capacity of universities, public research institutes and private centres engaged in research and in the training and development of human capital may determine how fast and how successfully an economy absorbs a new technological system or paradigm (Metcalfe, 1995).[2]

Each techno-economic paradigm requires a new infrastructure allowing the new technologies to be diffused throughout the economic system, while the dominant characteristics of the production system are restructured to incorporate processes that allow new products to be created and distributed. For each paradigm, there are common denominators that influence the behaviour of the relative costs, supply and diffusion of new technologies and the organization of production processes (Dosi, 1984). In particular, these involve: "(i) a relative cost perceived to be low and deceasing, (ii) seemingly unlimited supply, (iii) very wide potential diffusion in the production sphere and (iv) high probability of reducing the costs and changing the quality of capital goods, manpower and products, using technical and organizational innovations" (Pérez, 1985).

Table IV.1 shows the five technological revolutions that occurred between 1770 and 2000 and their corresponding techno-economic paradigms, as well as the characteristics of the industries and infrastructure underlying them (Freeman and Pérez, 1988; Pérez, 2002 and Castaldi and Dosi, 2007). In turn, the accelerated process of innovation and diffusion in biotechnology and the growing importance of nano-technology usher in a new phase in the technological revolution. In particular, the diffusion of biotechnology in the economy and in society is beginning to be felt in the areas of human health, agriculture and environmental monitoring, but the full magnitude of this development is by no means understood. In fact, the effectiveness of research and development efforts and the effect on the various economic and social activities are subjects of debate (Pisano, 2006).

For developing economies, it is important to realize that the various types of innovation occur simultaneously and that each of them poses a specific challenge for corporate and government strategy. Adoption and adaptation activities play a key role when a specific paradigm has already been established and diffused internationally and when, as in the case of biotechnology, it is at an embryonic stage. If the technology frontier is not expanded rapidly, ground can be gained by means of systematic efforts to invest in education and technology. A very clear example of this type of strategy is the Asian tigers, whose competitiveness and export development was for a long time based on the adoption and gradual adaptation of technological innovations to catch up with other countries in this regard (Rosenberg, 1976, 1982; Dosi, 1988, Cimoli and Dosi, 1995).

[2] Metcalfe (1995) defines an innovation system as "that set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process".

Table IV.1
THE INDUSTRIES AND INFRASTRUCTURES OF EACH TECHNOLOGICAL REVOLUTION

Technological revolution	New or redefined infrastructures	New technologies and new or redefined industries
First From 1771 The "Industrial revolution" Britain	Canals and waterways Turnpike roads Water power (highly improved water wheels)	Mechanized cotton industry Wrought iron Machinery
Second From 1829 Age of steam and railways In Britain and spreading to Continent and United States	Railways (use of steam engine) Universal postal service Telegraph (mainly nationally along railway lines) Great ports, great depots and worldwide sailing ships City gas	Steam engines and machinery (made of iron, fuelled by coal) Iron and coal mining (now playing a central role in growth) Railway construction Rolling stock production Steam power for many industries (including textiles)
Third From 1875 Age of steel, electricity and heavy engineering United States and Germany overtaking Britain	Worldwide shipping in rapid steel steamships (use of Suez Canal) Worldwide railways (use of cheap steel rails and bolts in standard sizes) Great bridges and tunnels Worldwide telegraph Telephone (mainly nationally) Electrical networks (for illumination and industrial use)	Cheap steel (especially Bessemer) Full development of steam engine for steel ships Heavy chemicals and civil engineering Electrical equipment industry Copper and cables Canned and bottled food Paper and packaging
Fourth From 1908 Age of oil, the automobile and mass production In United States and spreading to Europe	Networks of roads, highways, ports and airports Networks of oil ducts Universal electricity (industry and homes) Worldwide analog telecommunications (telephone, telex and cablegram) wire and wireless	Mass-produced automobiles Cheap oil and oil fuels Petrochemicals (synthetics) Internal combustion engine for automobiles, transport, tractors, airplanes, war tanks and electricity Home electrical appliances Refrigerated and frozen foods
Fifth From the early 1970s Age of information and telecommunications In United States, spreading to Europe and Asia and then becoming globalized	World digital telecommunications (cable, fibre optics, radio and satellite) Internet/electronic mail and other e-services Multiple-source, flexible-use electricity networks High-speed physical transport links (by land, air and water)	The information revolution Cheap microelectronics Computers, software Telecommunications Control instruments Computer-aided biotechnology and new materials

Source: Carlota Pérez, *Technological Revolutions and Financial Capital*, Cheltenham, Edward Elgar, 2002.

Moreover, the technological creation phase is very likely a moving target that shifts as the relevant frontier expands. In this connection, it is increasingly obvious that, if this stage is to be reached, Latin American national innovation systems must be strengthened and restructured, although the best avenues and policies for doing so are still being debated in developed and developing economies (Pérez and Soete, 1988; Cimoli and others, 2006a). However, some requirements are clear, such as the need to coordinate the various agencies working in the field of science and technology and to achieve greater private sector participation in technology demand and supply (see chapter VI). In addition, the ability of each country to respond to the major challenges implicit in the paradigm shift varies widely and, as will be seen in detail when the diffusion of new models in the field of information and biotechnology is considered, depends on a series of agents and variables.

A. The information and communications technologies (ICTs) paradigm

1. Origin and development

Many studies date the commencement of the digital paradigm from the introduction of the microprocessor in the early 1970s (Freeman and Louça, 2001). Change was thus triggered by an innovation with a system-wide impact on a special data-processing category: data manipulation using an integrated circuit of transistors on a single semi-conductor component. The scientific paradigm that led to this innovation was much older than the microprocessor: their common feature was the use of the binary digit or bit as the method for codifying data.

The conversion of data into bits allowed four basic operations to converge: (i) capture and adaptation, i.e., reproduction of data from one format to another; (ii) transmission, in the sense of reproducing at one place a message selected at another place; (iii) computation, i.e., data management by means of processing; and (iv) storage without data loss. These functions are closely interlinked and interdependent and make up the technology system known as information and communications technologies or ICTs (Peres, 2008).

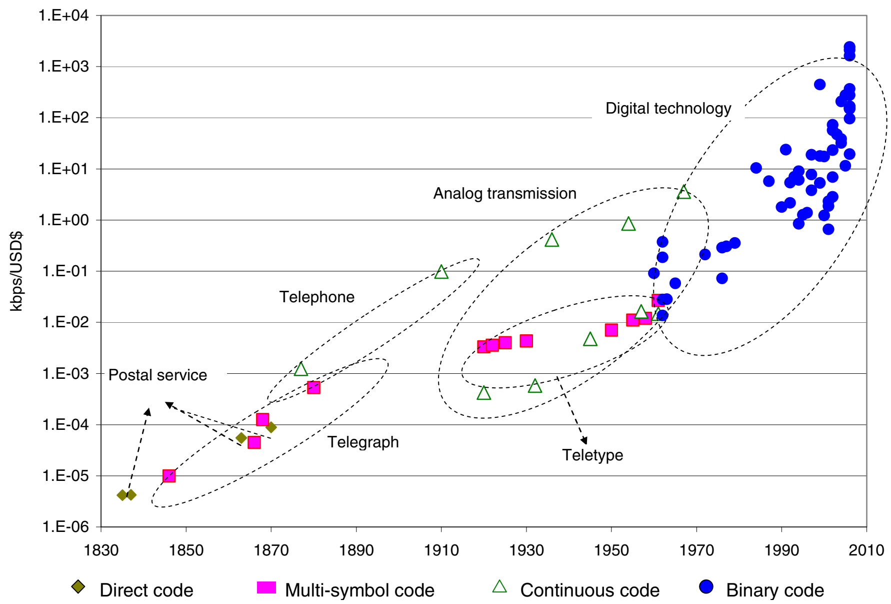
Figure IV.1 shows the historical trajectory of data transfer costs for different media, such as telegraph, telephone, telex, analog broadcasting (radio/TV) and digital technology. It shows the increasing efficiency of all microprocessor-based technologies.

The ability to communicate in real time has enormously increased the speed at which information is exchanged and the digitization of data, products and services has resulted in "the death of distance" (Cairncross, 1995), as evidenced by transactions conducted on line. This is leading to technology convergence in telecommunications where, on the one hand, the transmission of voice, data and images is combined and, on the other hand, fixed and mobile networks meet. The technical implications of these movements are technology shifts, including radical alterations in network architectures and operating protocols and integration of the various networks' functionalities, also resulting in transformation of the industrial organization of the sector. This convergence requires major investments to upgrade existing networks or install new ones, such as next generation networks (NGN), entirely built around the Internet Protocol (IP). This concept requires an architecture in which all services can be delivered using a single packet-switched network. Horizontal consolidation of this type has advantages connected with economies of scale and scope and with the provision of innovative and better-quality services for the benefit of users.

The desire for greater computation efficiency was one of the main reasons for advances in the ICT system. The exponential progress made during the microprocessor technology paradigm was exemplified by "Moore's Law",[3] which has been one of the most lasting phenomena in the history of technology development. The key to this continuous innovation trajectory is miniaturization, although this is reaching its limit now that the size of the atom is being achieved. Some analysts maintain that this phenomenon will put an end to the exponential growth in the technological progress of computation, while for others the exhaustion of a trajectory (in this case, the trajectory based on the silicon microprocessor) does not necessarily imply exhaustion of computation capacity.

[3] In 1965, Intel co-founder Gordon Moore stated that the number of transistors that could fit on a chip would double every two years. The result was an innovation trajectory with an exponential dynamic.

Figure IV.1
RATIO OF INFORMATION TRANSMISSION COST AND PERFORMANCE BY TECHNOLOGY
(2006 dollars)



Source: Martin Hilbert and others "Deepening comprehension of ICT innovation avenues: The formation of the digital paradigm through technological trajectories of storage, communication and computation", Santiago, Chile, Economic Commission for Latin America and the Caribbean (ECLAC), 2008.

Note: 84 technological solutions are included by year of release, estimating their performance in kilobits per second and their price in 2006 dollars. The y-axis is on a base-10 logarithmic scale. The 84 technologies are divided into four different technological trajectories: "direct code" communication technologies (including postcards, where the message is inseparable from the storage medium); "multi-symbol code" communication technologies (including telegraph, telegram, teletype and others that work with extended alphabets); "continuous code" technologies (including any analog transmission, such as telephone, TV and radio); and "binary code" communication technologies (including any digitally-based solution).

The drop in price and increase in capacity of microelectronic devices, computers, telecommunications equipment and control instruments have been determining factors for the transformation of society and the reorganization of production activities (see table IV.2). These trends are also decisive for evaluating the impact of ICTs on developing economies. However, in order to assess the impact in developing countries, the ability to reach the technology frontier must be considered, as well as the speed at which this frontier is expanding (Hilbert, López and Vasquez, 2008).

In more general terms, although the flow of radical and incremental innovations that accompanies the diffusion of the new paradigm is a very important source of growth opportunities, at the same time it represents an equally formidable threat to businesses and countries that do not make the necessary effort to diffuse the new paradigm and adapt it to their production structures and management methods. Because these general-purpose technologies produce cross-cutting effects in all sectors of the economy (pervasiveness), the technology gap has negative implications not only for certain sectors or branches of the economy but for the country's actual systemic competitiveness.

Table IV.2

INCREASE IN INSTALLED CAPACITIES AND REDUCTION OF PRICES FOR THE ICT TECHNOLOGY FRONTIER BETWEEN 1980 AND 2005

	Installed capacity per inhabitant			Technology frontier per dollar		
Basic function	**1980**	**2005**	**Multiplication factor 1980-2005**	**1980**	**2005**	**Multiplication factor 1980-2005**
Telecommunication transmission (kilobits/s)	4.6	193	42	$7 \times 10^{4-.}$ (Modem Apple II)	48 (WiMax)	68 571
Computation (millions of computers/s)	4×10^{4}	649	1 622 500	6 890 (IBM4341)	1×10^{10} (Precision Workstation 690)	1 540 000
Storage (MB)	0.015	30 658	2 043 867	0.0032 (hard disk 5MD HD)	2 000 (hard disk)	625 000

Source: Martin Hilbert and Osvaldo Cairó, "Quo Vadis information and communication technology: technological trajectories, state of the art and perspectives of the digital systems", Santiago, Chile, Economic Commission for Latin America and the Caribbean (ECLAC), 2008, forthcoming.

In developing countries, ability to reach the technology frontier depends on the policies pursued but also on income level and distribution. This is why, in assessing the impact of ICTs in Latin America and the Caribbean, international and national divides must be considered. These factors are considered in the first part, which discusses the impact of ICTs in the region. It also analyzes the effect of their incorporation in business and the hardware and software learning process.

2. Development of the information society and new opportunities in Latin America and the Caribbean

If the ICT paradigm is to be diffused in Latin America and the Caribbean, society as a whole, the infrastructure and the production system must adapt to the new processes and products being introduced, so as to generate substantial increases in productivity and well-being (Pérez and Soete, 1988; Peres, 2008). In the private sector, ICTs can reduce the costs of production, management and marketing and thus enhance competitiveness, while in the public sector ICTs make it possible to expand the reach of education, health and government services by eliminating barriers of time and space. In addition, ICTs can be a means of enhancing transparency in the public sector.

The difference between the speed of innovation in the leading countries (and the consequent expansion of the technological frontier) and the speed with which the less developed countries succeed in learning, imitating and adapting and thus reducing the technology divide from the frontier is crucial to redrawing the map of technology capacity and types of international insertion. Falling behind with regard to the new paradigm may have long-term consequences for competitiveness and growth. It should also be noted that the process of narrowing the divide is not necessarily the same in all sectors. While it is difficult for the countries of Latin America and the Caribbean to develop technology capacity and open up a new competitive environment for hardware production, the adaptation and use of ITCs can create great opportunities in other areas.

However, in order to analyze the impact of these technologies, one must consider that the issue is not only the international technological divide (separating the country's businesses from best international practices) but also the national divide. In fact, the two interact to determine the learning rate of a developing economy. Because of their ability to cross-cut the entire economy, in order to maximize their effects on systemic competitiveness and growth, ICTs must be diffused. If certain sectors or firms are operating under the old paradigm, the externalities and their ability to interact with those which have adopted the new paradigm are reduced. Similarly, much e-business depends on diffusion and knowledge of ICTs, which enable the public to access this emerging format.

Consequently, a prerequisite for harnessing ICTs is that the public must be given access to telecommunications equipment and services as well as training in its appropriate use in each sector of the economy. Without cross-cutting use of technology and complementary support, the resulting benefits are diluted. In Latin America and the Caribbean, an unequal and heterogeneous rate of adaptation is found in the various population segments and production sectors, making it difficult to create such complementarities (Peres, 2008). The topic of ICT adaptability is particularly important in the region, because its technological trajectories are determined by other economies, in particular the developed ones and, increasingly, some recently industrialized ones.

As instruments for increasing efficiency and business productivity, ICTs are crucial in order to preserve competitive environments. However, the countries of the region are slow to adopt these technologies and in many cases simply give workers access to computers and the Internet, without encouraging changes in organizational processes or adapting the technologies to Latin American and Caribbean needs and socio-economic realities. In recent years, in order to close this gap, most countries have formulated strategies, plans or agendas to develop public ICT programmes with a view to the construction of information societies. Strategies for the information society are based on two central ideas: the need to complement and correct market development and the need to increase the efficiency of ICT-related activities among all agents and sectoral authorities (Peres, 2008).

Although precedents do exist in some areas (telecommunications and the media), ICTs and the information society represent a new public-policy issue. Thus, there is no model as to how such policies should be designed and implemented. What we find is an ongoing learning process in which an attempt is made to find the right organizational method, which varies according to the policy goals and needs of each country.

Accordingly, ICT policies cannot, in the short term, be expected to achieve results similar to those that have had more time to mature, such as health or education policies, which moreover have their own institutions whose existence and legitimacy is not questioned. Thus, the challenge is to give continuity to policies that do not produce immediate results and whose implementation is still the subject of analysis and debate. Moreover, in view of the speed of technical progress, policies must have relatively short time frames and action plans must be constantly monitored and adjusted to emerging needs. Lastly, efforts to create a public policy agenda must deal with the economic and social heterogeneity existing both between and within the countries of the region, so that the needs and capacities of each country must be taken into account in order to achieve these policy objectives.

(a) Determinants of economic effect: adaptation and access

Existing studies on the effect of ICT capital on growth show that its effect is positive in all countries, albeit greater in developed ones. For the region as a whole, the contribution of ICT capital to GDP growth in 1989-2004 was below the world average and the average for the G-7 countries. Moreover, ICT investments also have a positive effect on productivity, although less in the region than in the developed and recently industrialized countries (Peres, 2008).

The difference in the repercussions of ICT capital on growth and productivity is due to complementarities with the assets of innovation systems and to the pattern of the international and national divides. The specificities of national innovation systems, as well as the training of human capital and technology capacity-building in the production system, determine the potential of a country to absorb and disseminate ICTs in the economic system.

As regards the ICT access divide, because of its rapid movement the frontier is a moving target on which it is difficult to focus. As shown in figure IV.2, although in recent years the region has made considerable progress as regards ICT access, which has enabled it to narrow the divide in the case of fixed and particularly of mobile telephony, progress has been insufficient to prevent a widening of the distance in terms of access to computers and to the Internet. Moreover, the divide is widening not only as regards ICT access but also as regards quality of access. One example is broadband: despite progress in the region, the difference compared with the countries of the Organisation for Economic Co-operation and Development (OECD) continues to increase (see figure IV.2). The broadband divide is causing concern, since broadband is becoming a determining factor for the use of new-generation services, characterized by multimedia applications requiring high connection speeds. Quality of access also depends on the capacity of terminal equipment to perform the processes of data transmission, storage and processing, which also determines the degree of sophistication of ICT use. According to available evidence, both aspects of the digital divide are increasing (see figures IV.3 and IV.4) (Hilbert, López and Vásquez, 2008).

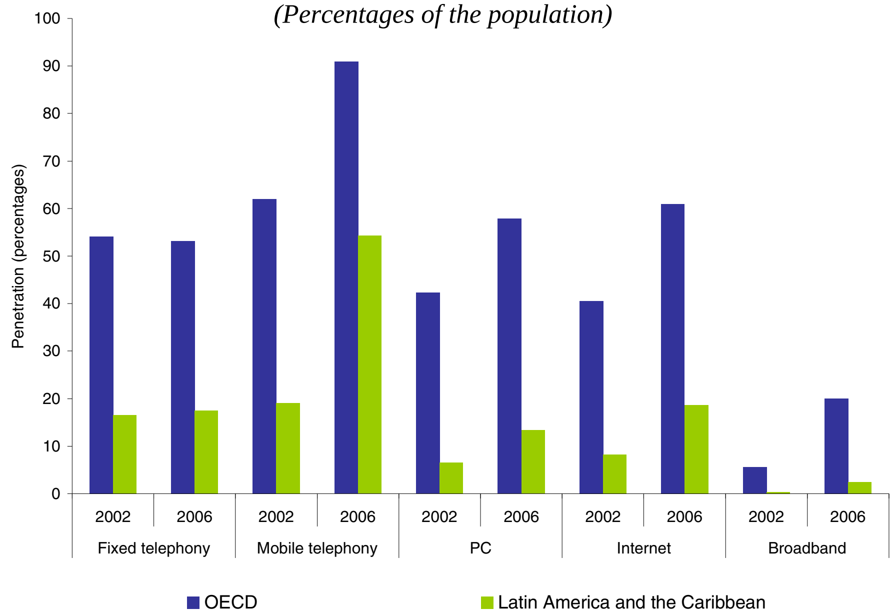
The distinction between the access divide and the quality of access divide is important. Although the international divide is narrowing in the case of mobile telephony, it is widening as regards connectivity with new technologies providing better transmission quality. This situation is aggravated if one considers that there is a third dimension of the divide: usage. Limited use is still being made of ICTs in the countries of the region, in the sense that the technologies are not fully incorporated in the population's production activities (Peres, 2008).

The digital divide within the countries of the region reflects inequalities of income, education, gender, ethnic origin and geographical location, which continue to hamper ICT diffusion and use. The national divide widens if newer technologies are included, the exception being mobile telephony, which is more equally distributed than fixed-line telephony. This is because it is cheaper to expand the mobile services network than the fixed-line network, allowing greater access and coverage.

Figure IV.2

ICT PENETRATION IN LATIN AMERICA AND THE CARIBBEAN AND IN OECD COUNTRIES, 2002 AND 2006

(Percentages of the population)

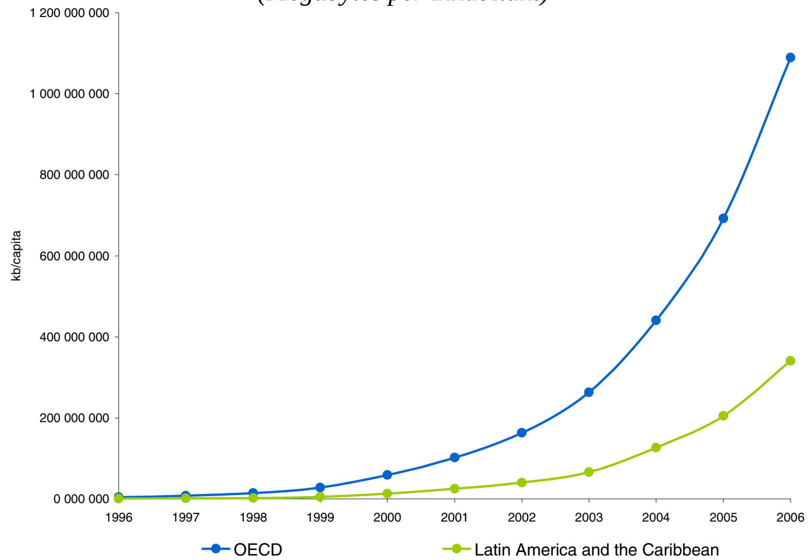


Source: Observatory for the Information Society in Latin America and the Caribbean (OSILAC), on the basis of information from International Telecommunication Union (ITU), "World Telecommunication/ICT Indicators Database 2007" [CD-ROM].

Figure IV.3

INFORMATION STORAGE CAPACITY ON HARD AND FLOPPY DISKS, MEMORY CARDS AND OPTICAL SOLUTIONS IN LATIN AMERICA AND THE CARIBBEAN AND IN THE ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD)

(Megabytes per inhabitant)

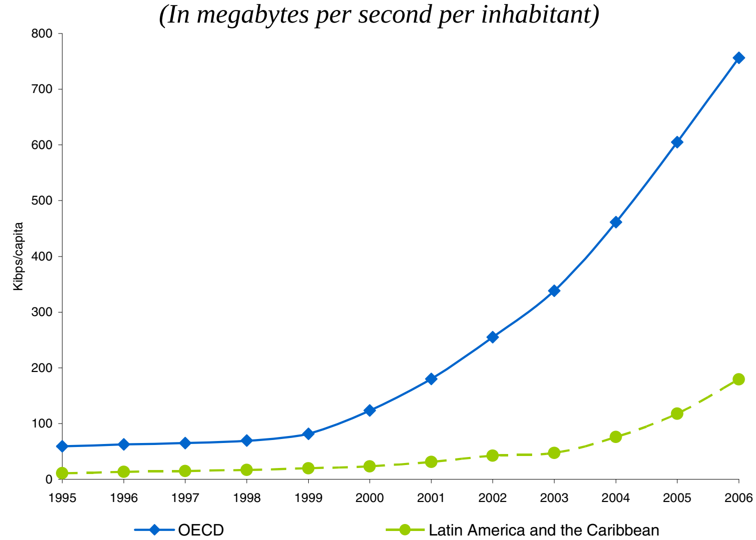


Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of Martin Hilbert and others, "ICT innovation avenues and the amount of digital information: deepening comprehension of the digital paradigm", Santiago, Chile, 2008, forthcoming, and Martin Hilbert and O. Cairó, "Quo Vadis information and communication technology: technological trajectories, state of the art and perspectives of the digital systems", Santiago, Chile, Economic Commission for Latin America and the Caribbean (ECLAC), 2008, forthcoming.

Figure IV.4

COMMUNICATION CAPACITY VIA FIXED AND MOBILE TELEPHONY AND THE INTERNET IN LATIN AMERICA AND THE CARIBBEAN AND IN THE ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD)

(In megabytes per second per inhabitant)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of Martin Hilbert and others, "ICT innovation avenues and the amount of digital information: deepening comprehension of the digital paradigm", Santiago, Chile, 2008, forthcoming, and Martin Hilbert and O. Cairó, "Quo Vadis information and communication technology: technological trajectories, state of the art and perspectives of the digital systems", Santiago, Chile, Economic Commission for Latin America and the Caribbean (ECLAC), 2008, forthcoming.

According to household survey data, access inequalities are more marked for computers and the Internet than for fixed and mobile telephony. Indeed, in the former case, the Gini coefficients have values over 0.60, which is higher than the coefficient for income distribution in the region (Peres, 2008). Access inequality due to income levels is compounded by the fact that these technologies are complicated to use and require some formal training. In general, people with more years of formal education use more advanced ICTs. This is particularly apparent in the case of the Internet, since its users are people with secondary and post-secondary education. Indeed, the latter —especially students— have usage patterns that are to some extent unrelated to their income level, provided that they do not come from the poorest strata.

(b) Adaptation in production processes and e-business

The digitization of information processes is reorganizing global production and transforming production processes and business strategies. Manpower availability, advantages of geographical location and ICT incorporation in the management of production processes affect the organization of production on a global scale. In the manufacturing sector, the use of electronic tools allows outsourcing by transnational corporations. These tools make it possible to set up more efficient production platforms because the various production links can be dispersed to areas of the world where they can be more competitive, since the electronic tools in turn allow global monitoring of the production chain in real time (see chapter V). This is also true in the tourist industry: airlines are making increasing use of electronic means not only as sales points for tickets but also to sell tourist packages, which means invading an area formerly controlled exclusively by travel agencies. These agencies, for their part, have had to replace their business models by more sophisticated electronic systems in order to serve clients on the Internet, as well as meeting local and foreign demand. In order to take advantage of the processes of reorganization of global production and of markets, it is crucial to reduce barriers to ITC access and use.

Although businesses in the region acknowledge that positive changes have resulted from the introduction of ICTs (mainly as regards customer satisfaction, reduced costs and higher revenue), there are still major gaps in the quality of adoption of these technologies, of their incorporation in the firm’s internal processes and of their linkage with the outside world.

Investments in business technology in Latin America and the Caribbean have focused on automation of the simplest back-office processes of an administrative rather than a productive nature, such as accounting, finance and human resources management (Cisco Systems/ICA, 2005). As shown in figure IV.5, fewer than half the businesses using digital applications have begun to adopt these tools for administration of the supply chain, automation of sales and management of customer relations. This is because of the learning curve involved in the reorganization of their internal processes.[4]

A strategy must also be devised for the digitization and optimization of firms’ back-office and front-office processes. The goal of an e-business strategy is to improve the management of business processes and organize information flows and communications, so as to reduce uncertainty and increase control over production and administration processes. At the same time, this increases flexibility and creates value through optimization of communication and marketing channels with customers and suppliers. This effort is supported by a combination of technologies for the storage, interface, exchange and processing of large volumes of information in real time between various trading areas.

[4] As regards connection speed, businesses in the region are not falling far behind. About 77% of businesses with more than 25 employees have broadband connection, although the large majority connect at speeds below 1,544 Mbits/s; this is an obstacle to transactions and processes using electronic means, which generally require connection speeds of over 1 megabyte per second.

Figure IV.5
BUSINESSES AND ORGANIZATIONS WITH NETWORK-ENABLED APPLICATIONS BY AREAS OF WORK IN LATIN AMERICA AND THE CARIBBEAN, 2005 [a]
(In percentages)

Source: Cisco Systems/Institute for Connectivity in the Americas (ICA), "Net impact Latin America: from connectivity to productivity [online] http://www.netimpactstudy.com/nila/pdf/netimpact_la_full_report_t.pdf.

[a] Includes businesses and organizations with more than 25 employees in the private and public sectors.

The fact that businesses in the region became interconnected without first digitizing their internal information adversely affects the quality of data transmitted over digital networks and the potential for the use of new technologies for complete automation of the production process. The difference in the way information is handled inside and outside the organization is a major obstacle to complete digitization of processes, since it is only when both challenges are met that the full potential of e-business can be realized.[5] In order to achieve greater automation of internal management, not only must user businesses adapt but suppliers of these technologies must also offer administrative solutions suited to the culture and needs of the region, at reasonable prices. The automation of processes, reorganization of management and training of human resources take time and money. Small and medium-size businesses need financing arrangements that enable them to survive this transition phase.

To sum up, businesses in the region must not only incorporate technological change, by importing solutions and practices from business conducted in more advanced economies, but must also be capable of acting in the new context with tools appropriate to the situation. For this, they need improved adaptation capacity and a greater learning effort.

(c) Hardware and software learning

Only a few countries in Latin America and the Caribbean have succeeded in penetrating some segments of the world market for hardware production. The main manufacturers, in order of importance, are Mexico and Brazil but there are differences between them. Mexico is a large

[5] At the mid-point of the current decade, the number of computers in businesses with more than ten employees was basically similar in several Latin American countries (80%) and in most developed countries (90%). What differentiates the process of ICT adoption in these two regions is the pattern of distribution of computers and the introduction of on-line solutions such as the Internet and networking sites. In 2000, 90% of European businesses had computers, 21% had Internet access and about 10% had closed and inter-firm networks (intranet and Electronic Data Interchange) (EUROSTAT, 2002). When digital communication networks arrived in developed countries, businesses there had thus already completed a process of learning and digitization of much of their internal information flows, using unconnected computers. On the other hand, in Latin America and the Caribbean both aspects of digitization are occurring simultaneously. In Chile, for example, in 2001 64% of businesses had computers and 44% had Internet access (Chile, Under-Secretariat for the Economy, 2002).

exporter of assembled products for the United States market, using the *maquila* or active processing approach, whereas Brazil produces for the domestic market, with the exception of a few exports to the region. The other countries of Latin America and the Caribbean have smaller operations, devoted almost exclusively to assembly of imported parts and components.

Although the large transnational corporations producing ICT hardware are present in the region, the local added value is very small, which hampers development of the industry's innovation capacity. Recent world transformations in the industrial organization of the sector and the new technologies tend to aggravate this situation, since entry barriers are rising as a result of technical progress, shortening of product life cycle and larger-scale production (FINEP/MCT, 2004; Gutiérrez and Leal, 2004; ECLAC, 2008).

However, lack of production capacity is not preventing the automation of economic and social organization, since the equipment needed is tradable on the world market. For most countries in the region, the point is not so much to produce hardware locally but to enhance domestic efforts to adapt and create capacity in the software and related services industry.

As far as software is concerned, it is important to use the latest generation available on the international market, suitably adapted to local conditions. Such software facilitates and organizes information flows and communication between organizations of all kinds, such as businesses, hospitals, schools and municipal authorities. The software for businesses or specific sectors is mainly basic tools for increasing productivity and harnessing the potential of information societies, since their architecture determines the players' new organizational and institutional configuration. The participation of technicians from each area (education, health, other) is crucial in the process of technological adaptation, so that the instruments generated are appropriate for the needs of these groups. In addition, it is essential to train senior staff: unlike the situation with regard to hardware production, the application, adoption, adaptation and maintenance of software systems require knowledge of local processes. In general, the existence of a critical mass of players with skills in this area is crucial if advantage is to be taken of the opportunities opening up in related services for the adaptation of ICTs to local requirements and if exports are to be increased, since production is geared to internationally standardized demand (see chapter V, section D).

The software and services industry (SSI) is a source of economic growth for two reasons. Firstly because it increases business productivity and education and health services, with the resulting favourable effect on human capital. Creation of new software raises the system's levels of productivity and has become a growth industry. Secondly, this activity generates skilled jobs and exports of goods and services produced off-site, especially when technological advances occur in the areas of communications and systems architecture.

Although the region's global SSI does not play a role commensurate with its relative importance in the world economy, it has gradually increased its participation, having taken advantage of its growing domestic market and export opportunities. Participation in world offshore operations of businesses located in 14 Latin American countries increased from 1.9% in 2001 to 2.7% in 2005 (WITSA, 2006). These businesses are concentrated in Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico and Uruguay, and these countries account for almost 90% of total SSI revenue in the region. Although the participation of the sector in the economy and the export coefficients are not large, except in the case of Costa Rica and Uruguay (see table IV.3), this industry has significant development potential.

The diffusion of ICTs in the region has increased the demand for skilled professionals, not only in the software and services industry but also in user businesses.[6] In 2005, businesses in this industry employed 337,000 people in Latin America and the Caribbean, which is 0.19% of the

[6] In 2005, firms in Mexico employed 269,000 workers to conduct in-house software design, which is five times more than the 54,000 employed directly in the software and services industry (Mochi and Hualde, 2006).

active population (see table IV.3),[7] excluding persons working in informal conditions and in user businesses.[8] For all ICT activities, it is estimated that the labour force employed accounts for about 1.9% of the total (López and Ramos, 2007b), a percentage which is about half that in the OECD countries, where 4% of all workers are employed in activities directly related to ICTs, either in sector businesses or in user firms. In addition to the workers directly involved in ICTs, it is estimated that about 20% of urban workers use the technologies in their work, although their jobs do not focus on them exclusively (OECD, 2006).

Table IV.3
SALES AND EXPORTS OF THE SOFTWARE AND SERVICES INDUSTRY, 2004
(Millions of dollars and percentages)

	Sales	Exports	Sales/total GDP	Percentage exported	Percentage of total employment
Argentina	1 173	191.6	0.77	16.3	0.17
Brazil	8 213	314	1.36	3.8	0.23
Chile	1 385	68.8	1.46	5.0	0.44
Colombia	340 [a]	10.3 [b]	0.35	3.0	0.17
Costa Rica	173	80	0.91	46.0	0.28
Mexico	2 871	125	0.42	4.4	0.11
Uruguay	226	88.7	1.70	39.3	0.31
Total	14 381	878.4	0.85	6.1	0.19

Source: Andrés López and Daniela Ramos, “Oportunidades y desafíos de la industria de software en Argentina”, Santiago, Chile, Economic Commission for Latin America and the Caribbean (ECLAC), 2007, forthcoming; and “Complementación productiva en la industria del software en los países del Mercosur: impulsando la integración regional para participar en el mercado global”, cap. 1, MERCOSUR Economic Research Network/Swiss Agency for Development and Cooperation [online] http://www.redmercosur.org.uy/uploads/cms_news_docs/Informe_Final_Regional_Complementariedad.doc, 2007; and for Costa Rica, Economic Commission for Latin America and the Caribbean (ECLAC), *Statistical Yearbook of Latin America and the Caribbean, 2007* (LC/G.2356-P/B), Santiago, Chile, 2008. United Nations publication, Sales No. E/S.08.II.G.1.

[a] Does not include local services firms. Estimated on the basis of sales by 561 firms: 542 local software designers (with sales of 150 million dollars) and 19 subsidiaries of multinational corporations (with sales of 190 million dollars).

[b] Exports of 542 local software designers.

In Latin America, SSI has essentially developed spontaneously; only in recent years have public policies been put in place to promote the sector. These policies, and those to be formulated in the future, will have to pursue different economic and social goals. The creation of a critical mass of qualified workers is key to the provision and adoption of software suited to local economic processes. In order to create jobs and exports, investment by large businesses must be attracted, and consideration is therefore given to two decisive factors relating to the location of such firms’ operations: costs (influenced by the exchange rate, wage level, tax treatment and access to telecommunications services) and availability of skilled staff.

Policies regarding education and technical and scientific infrastructure development probably have the greatest potential to develop the sector in the medium and long term. No country can aspire to an important role in the global software industry without making considerable investments in human resources training. These policies should focus not only on increasing the availability and improving the quality of higher technical courses but also on preparing and motivating young people to study ICTs, in order to broaden the worker base.

[7] The fact that only one out of every 500 persons employed in the region works in the software and services industry is in striking contrast with the situation found in developed countries, such as Canada, where one out of every 50 persons works in these activities (calculations based on OECD, 2006).

[8] For example, according to estimates of the National Federation of Information Technology Companies (FENAINFO), the software sector employs one million people in Brazil, of whom 70% have no formal employment contract.

Lastly, software and services education programmes must be coordinated with national strategies for development of the sector. In densely populated countries, the availability of human resources may bolster a strategy designed to attract labour-intensive operations. Here it is important to motivate students to enroll in technical education courses. In countries with a smaller supply of labour which already have relatively high software export coefficients, the development strategy should emphasize value added. This includes training of senior staff, investment in research and encouragement of international cooperation.

To sum up, if advantage is to be taken of the new opportunities, it is necessary to improve complementarities in the area of human resources, ICT use by businesses (electronic processes and e-business) and access to computers and the Internet, especially broadband. The design of software and its use in local production processes provide an opportunity to improve both productivity and international insertion in services sectors.

B. Scope and opportunities of the biotechnology paradigm

Biotechnology has spread less than ICTs and has not yet come into its own (Bisang and others, 2007; Gutman and Lavarello, 2007). The ongoing scientific advances in the areas of molecular biology and the related sciences, as well as the opportunities arising in the medium and long term for the development of new products and processes, confirm that biotechnology is a new technological paradigm and one of the most powerful far-reaching technologies of the twenty-first century (see table IV.4 and European Commission, 2007; Díaz and Golombek, 2004; Christensen, 2003). There is broad consensus on the diffusion of the biotechnology paradigm as a generic and multidisciplinary technology, which can affect a very large group of activities and sectors. In addition, biotechnology shows a strong convergence with other technologies, such as ICTs and nano-technology. Thirty years after it was first used and despite the fact that it has not yet revealed its full potential, the biotechnology paradigm is already redefining the functioning and configuration of very diverse social and economic sectors, especially in the areas of medicine, human health and agro-food production.

The fact that the changes and the creation of new competitive advantages accompanying the new paradigm have not been fully disseminated represents a source of opportunities for the region, but at the same time poses a threat if countries do not make the necessary efforts to create a system capable of increasing research and development activities and human resources and steering them towards the new technologies, and thus of stimulating competition in various sectors. The creation of a pre-competitive system for biotechnology can be considered as a preliminary knowledge accumulation stage, allowing countries to adapt the new technology and move on from less complex activities (such as molecular markers or plant micropropagation) that do not yet involve expansion of the knowledge frontier to other activities of growing complexity.

The specific features of biotechnology activities are reflected in a series of new challenges (Pisano, 2006; Valentin and Jensen, 2002; Orsi and Coriat, 2003; and Gutman and Lavarello, 2007). Firstly, the highly multidisciplinary and complex character of the scientific basis of these new technologies (molecular biology, cell biology, genetics, biochemistry, chemistry, bio-informatics, physics and various areas of medical science) requires mechanisms for integration of diverse areas of knowledge, with the additional difficulty that these technologies are evolving rapidly in a scientific dynamic that often moves faster than the development possibilities and timing for new products and processes.

Table IV.4
PRINCIPAL ACTIVITIES IN THE BIOTECHNOLOGY PARADIGM

Activities	Scientific advances	Opportunities
DNA/RNA, rDNA [a]	Genome, gene, DNA sequencing; DNA and RNA synthesis and amplification; Pharmacogenomics and genetic engineering; Antisense technology, gene expression; Gene therapy	Analysis and modification of genetic material
Proteins	Protein and peptide sequencing/synthesis/engineering; proteomics; protein isolation and purification, identification of cell receptors; viral vectors; other	Analysis and modification of proteins
Metabolites	Identification and quantification; Metabolic engineering	Analysis of metabolites (small molecules)
Cells and tissue culture	Cell hybridization/fusion; tissue engineering; embryo technologies; related technologies	Cell manipulation for various purposes
Processes (bioprocessing)	Fermentation using bioreactors; bioprocessing; associated technologies (bioleaching, biopulping)	Applications for fermentation processes
Converging with other technologies	Bioinformatics	Computation applications for the analysis and storage of biological data (genomes, protein sequences, modelling of complex processes, etc.)
	Nanobiotechnology	Application of nanotechnology/ micromanufacturing tools and processes to construct various biotechnology devices and applications (studies of biosystems, diagnostics, etc.)

Source: Organisation for Economic Co-operation and Development (OECD), *Information Technology Outlook, 2006*, Paris, 2006; European Commission, "Consequences, opportunities and challenges of modern biotechnology in Europe", *JRC Reference Reports*, Eleni Zika and others (eds.), 2007; and Anthony Arundel, G. Crespi and P. Patel, "Biotechnology", *Scoping Paper*, Europe Innova, 2006.

[a] DNA: deoxyribonucleic acid; codifies information for the reproduction and functioning of cells and for the self-replication of the DNA molecule. RNA: ribonucleic acid; acts as intermediary and complement of the genetic instructions codified in DNA. rDNA (recombinant): DNA molecule formed by OPI joining of pieces of DNA from different organisms.

Secondly, these are activities that mature over long periods of time and require huge research and development investments. Approximately ten years and US$ 300 million are required to complete all the necessary stages, technological and regulatory, before a new pharmaceutical drug can be put on the market; and the same amount of time and US$ 30 million are required to introduce a genetically modified seed. In addition, the uncertainty and risks are very high, so that special mechanisms are needed to manage the risks and guarantee innovating firms' ownership of their results (Hopkins and others, 2007).

Thirdly —and this is related to the two previous points— the organizational structure of the "biotechnology business" in the developed countries is not yet settled and has important specific features in the various sectors of application. Biotechnology advances in the human health sector have produced a model characterized by a "knowledge market", in which businesses and universities exchange their technology assets, using intellectual property mechanisms and capital markets. As will be seen in detail in chapter V, this model tends to be replicated, at different speeds and to varying extents, in other areas of application of the new technological paradigm, such as agriculture and foodstuffs (Pisano, 2006).

Fourthly, the learning processes have marked complementarities with traditional technologies and also require the creation of complementary assets. It is important to distinguish in business strategies between the role of complementary assets in ownership of innovation results and the role of new knowledge generation. Control of these assets —which include production capacity and management of traditional technologies, distribution channels, capacity to manage market access, and information management and merchandising (Teece, 1986)— is one of the basic mechanisms for ownership of the quasi-rents of innovation.

1. Development and principal trends of production reorganization

The existing and potential areas of application of biotechnology cover a broad range of economic sectors and services: human health (biopharmaceuticals, therapeutics, *in vitro* diagnostics, recombinant vaccines and drugs); agriculture (genetically modified crops, inoculants, plant micropropagation, biological control and molecular markers); animal health (vaccines, diagnostics and improvement of species); food industries (fermentation processes, functional foods, probiotics and prebiotics); environment (waste processing, bioremediation, water purification); industrial processing (bioprocessing in the textile, leather, pulp, paper and other industries; non-food uses of plants and crops); support services (product testing, quality control, technology consultancies; pilot production services), and exploitation of natural resources (Van Beuzekom and Arundel, 2006 and European Commission, 2007).

So far, major advances at the global level have been concentrated in three areas: medicine and human health, agricultural production and foodstuffs. Around the end of 2003, the distribution by sector of biotechnology firms in the United States was as follows: 60% in the human health sector; 33% in services; 5% in agricultural biotechnology; and 2% in environment. The figures for the European Union were 51%, 35%, 7% and 7% respectively (EuropaBio, 2005).

The United States leads the biotechnology market for medicine, human health, seed genetics and other industrial markets such as polymer biotechnology. These sectors represent about 3% of GDP and are among the most dynamic in the economy. In the European Union (a region in which the application of genetic engineering technologies to agricultural production has not yet been approved), the use of products derived from biotechnology accounts for between 1.4% and 1.7% of GDP, which is similar to the share of the agricultural sector (1.8%) or the chemicals sector (1.9%) in 2002 (European Commission, 2007). At the same time, new emerging countries such as China and India are beginning to gain a foothold in global biotechnology markets.

Table IV.5 shows investments in biotechnology research and development and sales of biotechnology products in all the OECD member countries in 2005. There are considerable sectoral disparities in private research and development efforts: health applications account for 87% of biotechnology research and development expenditure, while agro-food systems represent only 4%. A similar pattern is observed in sales by the various sectors with greater biotechnology assets. However, as will be seen in chapter V, starting in the mid-1990s, agro-food production was marked by an increase in opportunities for the development of new products and processes.

Table IV.5

MEMBER COUNTRIES OF THE ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD): EXPENDITURE ON BIOTECHNOLOGY RESEARCH AND DEVELOPMENT AND SALES, 2005

Biotechnology intensity and sales				
Application	**Investment in research and development**		**Sales**	
	Million PPP dollars	**Share**	**Million PPP dollars**	**Share**
Health	20 740	87%	65 985	80%
Agro-food	1 027	4%	5 231	6%
Industrial	456	2%	4 566	6%
Other	1 626	7%	7 072	9%
Total	23 850	100%	82 853	100%

Source: B. Van Beuzekom and A. Arundel, *Biotechnology Statistics,* Paris, Organisation for Economic Co-operation and Development (OECD), 2006.

A heterogeneous group of firms is engaged in biotechnology activities: large vertically integrated multinational corporations, with a strong specialization in biotechnology, public research agencies and venture capital. This diversity has been encouraged by several factors, including the possibility of using knowledge in modular form. The businesses specializing in biotechnology were already dealing with fine chemicals and pharmaceutical drugs and then turned to biotechnology applied to agro-food in an intense process of mergers and acquisitions (Bisang and others, 2007). In the case of venture capital, knowledge is generated by specialized firms and their rights are sold to larger firms which involve them in the production process. This is known as the monetization of intellectual property. The emergence of firms specializing in biotechnology was partly provoked by sweeping institutional changes, such as the 1980 Bayh-Dole Act in the United States, which allowed public universities and laboratories to patent their research and then grant licences in the private sector.

The cross-cutting nature of the new paradigm, the complementarity with various scientific disciplines and the reformulation of intellectual property systems created important opportunities for the adoption of biotechnology, which are reflected, inter alia, in the evolution of biotechnology patents. Between 1991 and 2002, the number of patents of this type submitted to the European Patent Office (EPO) increased by 8.3 % a year, which was a larger increase than for the total number of patents (5.7%). This trend began to accelerate in 1994 and then started to slow down in 2003, partly because of the tighter restrictions imposed by EPO for the consideration of biotechnology patents (Van Beuzekom and Arundel, 2006).

The “monetization of intellectual property” was a powerful force in the configuration of the biotechnology industries. This reorganization of biotechnology business is the result of a series of far-reaching institutional innovations that made it possible to expand the range of patentable objects and the number of organizations allowed to enter the industry. This makes it possible for science and technology institutions to obtain patents for their research, for firms specializing in biotechnology to be quoted on the stock exchange and for patents to be obtained for living organisms. In this new context, the idea is taking shape that monetization of intellectual property involves development not of a product but of a knowledge module and tries to obtain financial gains by granting licenses or concluding other market agreements (Pisano, 2006). Module-based scientific knowledge facilitates specialization and fragments intellectual property rights. The limitations still existing on the degree of modularization of advances in science and technology in the areas of application of biotechnologies pose additional challenges for knowledge integration and encourage the creation of various forms of alliances.

In the United States, the 1980 authorization to patent government-sponsored scientific discoveries, a strong system of intellectual property rights and more flexible academic standards created new business opportunities in the private sector which had important effects on the industry structure. The United States model of industrial organization is solidly based on the presence of firms specializing in biotechnology and on large pharmaceutical firms, which have encouraged the creation of technological alliances and which have sizeable venture capital and strong financial input from the government sector. The number of new biotechnology firms is growing and is coordinated by market mechanisms, unlike in other countries, such as France or New Zealand, where government policies are mainly responsible for the emergence of firms specializing in biotechnology.

The multinationals' accumulation of biotechnology capacity and diversification enabled them to take advantage of their technological advantages in several areas of application (pharmaceuticals, food, genetically modified seeds). This was the origin of the "life science" industries —a process which provoked greater intersectoral rivalry, entry of these corporations into other activities and consolidation of new players in the agro-chemical and pharmaceutical complex. These large corporations rapidly applied biotechnologies to a large range of products, from pharmaceuticals to agricultural inputs, and were thus able to diversify production. Together with the creation of strategic alliances, mostly highly asymmetrical and coordinated by the leading multinationals, the pattern of biotechnology diffusion reflects capital centralization processes through mergers and acquisitions that allowed economies of scale and control of productive assets and complementary technologies. At the same time, strategies to protect the intellectual property rights of the various participating agents also played a very prominent role.

2. Efforts and opportunities in Latin America and the Caribbean

With regard to the evolution of biotechnology at the global level, some questions arise to which no satisfactory response has yet been found. Although this sector is witnessing a proliferation of genomics-based scientific discoveries and new biotechnology techniques, some authors maintain that there have been no major increases in research and development productivity or in the generation of new types of pharmaceuticals with significant impacts on the health system (Hopkins and others, 2007).[9] This is because science and its commercial applications have different dynamics. In particular, biotechnology firms have to deal with the persistent uncertainty surrounding these activities, the complex nature of basic scientific knowledge and the rapid rate of advance of scientific knowledge. For this reason, some authors believe that average profits in the sector as a whole are meager, despite the fact that some large firms have done a great deal of business (Pisano, 2006). Other authors, on the other hand, are of the view that the presence of a small number of leaders in this market does not invalidate the biotechnology industry model, since the profits of biotechnology firms grew more rapidly than their expenditure on research and development (Glick, 2007).

Regardless of this discussion, it is clear that the opportunities created by biotechnology advances are resulting in industrial restructuring, emergence of specialized firms and creation of strategic alliances. Regulation of demand by health institutions, medical organizations and the health and food security system has played a key role in the diffusion of biotechnologies. This clearly challenges the region to seize the opportunities of the biotechnology paradigm (CyT DES, n/d).

A series of indicators relating to expenditure on research and development, the number of local patents, the size and density of national or international biotechnology firms based in these countries and the number of researchers in areas related to biotechnology confirms this evaluation (table IV.6).

9 Biopharmaceutical sales represent just over 10% of world pharmaceutical sales (between US$ 55 and US$ 66 billion of the US$ 550 billion global sales) and three quarters of the applications are concentrated in only 15 therapeutic classes of products (Hopkins and others, 2007).

Some Latin American countries made considerable strides in this regard until the 1990s and were among the few developing countries with biotechnology patents. However, during the 1990s, the Asian countries had many more biotechnology patents granted in the United States, as a result of an aggressive policy of financing biotechnology research and development and the return home of scientists trained in developed countries. Starting with a similar number of patents, in 2000 the Republic of Korea had an accumulated volume of patents that was almost ten times larger than that of Brazil and more than twenty times larger than that of Argentina. In this context, it is important to note that the number of researchers and the number of firms in the countries of the region show, albeit in embryonic form, the potential for development and adaptation of biotechnology-related activities. This topic will be dealt with in greater detail in chapter V, section B, on agro-industry.

Table IV.6
PERFORMANCE INDICATORS AND BIOTECHNOLOGY CAPACITY IN SELECTED COUNTRIES

	United States	**China**	**India**	**Singapore**	**Brazil**	**Argentina**	**Chile**	**Colombia**
USPTO [a] biotechnology patents (up to 2003)	62 903	143	279	39	47	21	4	8
USPTO biotechnology patents (up to 1990)	11 164	5	9	0	5	5	…	…
Medline publications (2000)	146 622	…	…	…	4 021	1 466	555	175
Number of researchers in biology and related disciplines (2000)	446 890	50 000	…	1 000	20 233	9 587	1 860	2 000
Number of basic biotechnology firms (2002-2003)	1 457	136	96	…	213	84	31	10
- Human health	947	86	…	…	140	20	16	…
- Agriculture	175	23	…	…	65	54	29 [b]	…
- Agrifood industries (AFI), other	335	27	…	…	8	10 [c]	13	…
Patenting gap (United States=100) (up to 2003)	100	0.23	0.44	0.06	0.07	0.03	0.01	0.01
Patenting gap (United States=100) (up to 1990)	100	0.04	0.08	0.00	0.04	0.04	…	…
Biotechnology firms (per 10 million inhabitants)	49	1	1	…	11	22	19	2
Utilization index (patents/publication) [d]	0.43	…	…	…	0.01	0.01	0.01	0.05

Source: National Science Foundation, "Science and Engineering Indicators 2006" [online] http://www.nsf.gov/statistics/seind06/pdf_v2.htm#c5; J. Niosi, "La biotechnologie en Amérique Latine", *La chronique des Ameriques*, December 2006; L. Orozco and D. Olaya, "Indicadores del Programa Nacional de Biotecnología", *Observatorio Colombiano de Ciencia y Tecnología*, 2004; R Bisang and others (eds.), *Biotecnología y desarrollo. Un modelo para armar en la economía argentina***,** Editorial Prometeo, 2006.

[a] United States Patent and Trademark Office.
[b] Includes only food biotechnology firms.
[c] Includes only food biotechnology and industrial firms.
[d] Ratio of USPTO biotechnology patents to BioMed base publications.

Developments in Asia reveal the developing countries' huge potential for adoption and innovation in the context of the biotechnology paradigm. At the same time, they reveal a widening divide compared not only with the leading countries but also with the emerging countries.

As has been pointed out, the biotechnology paradigm is transforming various aspects of business strategy, the business model and the structure of production sectors. In addition, it is also accelerating and transforming the markets to which knowledge is transferred. The monitoring of these transformations, both in the case of countries with capacity to generate and develop new knowledge and in the case of countries where there is capacity to adapt the new paradigm, requires a research and development effort and a very large critical mass of human capital, in view of the speed of scientific discoveries and their applications.

Because of the new institutional context and the incentives associated with intellectual property rights, patents are becoming strategic assets whose value is increasingly detached from a specific product and associated with possible future scenarios (Pisano 2006; Díaz, 2008; Cimoli and Primi 2008). In these scenarios, what counts is not only the potential technological value of biotechnology but also its role in competitive strategies. Biotechnology patents make it possible to block access by competitors, to ensure dominance in specific technological areas, to enhance negotiating power in the exchange of licences, to protect oneself in the event of litigation for infractions or simply to acquire insurance against the uncertainty of scientific progress. All these aspects confirm the importance of diversity in the region's firms with biotechnology assets and the need for policies to ensure that they are speedily incorporated in the dynamic of the new paradigm.

Chapter V

Opportunities associated with the restructuring of production sectors

This chapter deals with the opportunities and challenges that different sectors and kinds of firms face as a result of the new international economic context; this context is dominated by the continual changes inherent in technological progress as new technological paradigms emerge and become consolidated, profoundly affecting the region's competitiveness and international position.

As noted in earlier chapters, some thought needs to be devoted to the place the region occupies within this global structural shift and the roads that lie open towards international integration and the building of technological know-how in different sectors. In other words, as the global structural shift redefines the existing and potential openings to develop competitiveness in Latin America, it is extremely important to grasp what those openings mean in terms of technological learning, both for export performance and for the productive and technological linkages they help to form. Creating or strengthening the links between competitiveness and learning could help to lock the region onto a growth path built increasingly on technological know-how and innovation. Such a growth trajectory would also redefine the region's modalities of external integration.

In order to gain an understanding of learning dynamics, it is necessary to look both at whole sectors and at the trajectories of individual firms, and thus form a picture of the variety of different learning patterns. The opportunities available in different sectors depend on their respective sectoral dynamics and also reflect the learning processes associated with the spread of technological paradigms (such as ICTs and biotechnology). Hence, this chapter examines the openings for competitiveness and learning in the different sectors of the production system. Given the significance of the changes in the production structure globally (see chapter I, section C), it also looks at how the different sectors have integrated into global value chains and at the constraints and opportunities that have arisen in this process.

One opening for competitiveness is found in the manufacturing industry, with two clearly differentiated variants. First, there is the manufacturing sector handed down from the import-substitution model of industrialization, which enjoyed government protection and the stimulus of public policies to promote and develop technological know-how as applied to products and process engineering. Mounting external competition in the last two decades has narrowed the dimensions of this sector and the learning process followed hitherto, while honing the efficiency and improving the international position of those segments and firms that have survived. Although, overall, exports and, especially, technological developments have been only modest (see chapter III, section C), several firms and services have made great strides in both, and this indicates the real possibility of combining and developing competitiveness and capacities based on a configuration quite different from that of the old industrialization pattern.

Another variant of this opening for competitiveness is the development of the export manufacturing industry in Mexico and Central America, as well as some Caribbean countries (such as the Dominican Republic). This industry hinges on the division of labour within large multinational firms and the formation of value chains in each sector or on the global production network, as the case may be. Here, the opportunities lie in the promotion of more intensive learning processes to increase the value added of local production and, in particular, to reduce the asymmetry of global value chains and of technology flows with respect to parent companies. Like in the case of natural resources, technology spillovers do not happen spontaneously; on the contrary, they require active policies to build complementary local capacities at the level of production linkages. Public policies are all the more important bearing in mind that competition from China has been particularly damaging to those countries whose international market integration relies on labour-intensive sectors.

A second clearly defined opening for competitiveness is that of sectors that make intensive use of natural resources. As observed in section C of chapter III, these sectors offer opportunities for learning processes and product innovation and, especially, diversification within sectors or products. Diversification becomes ever more important as markets become increasingly segmented and different users develop very particular demands.[1] Also, there are opportunities for technological linkaging between the natural-resource-intensive sector and suppliers of highly complex equipment, inputs and services. If there is a demand for very complex equipment and inputs, then there is scope to develop engineering-intensive sectors; the need for progress in technologies used for processes and prospecting (such as deep oil drilling, the use of biotechnology and the modelling of data for prospecting in the mining industry) represents an opportunity to move ahead in different fields of knowledge.

More now than ever, systemic aspects and participation in networks are key assets for competitiveness (Freeman, 1990; Cimoli, Dosi, Nelson and Stiglitz, 2008, Pérez 2008; Hernández, Romero and Cordero, 2006). For this reason, this chapter will also examine the value chains of which agroindustry and mining are part, along with the constraints and opportunities for progress in the more dynamic segments of those chains.

[1] See chapter I and Schott (2004); Fontagné, Gaulier and Zignago (2006) and Pérez (2008).

A last opening for competitiveness lies in the development of the different areas of the services sector: transport, finance, tourism and enterprise. This sector represents an increasing percentage of GDP and employment in mature economies and in Latin America and the Caribbean. Some authors, including Rowthorn and Ramaswamy (1999), have suggested that the growing weight of services in the developed economies is a natural and desirable trend that reflects the evolution of demand patterns and generates high-productivity employment. Although the services sector is usually associated mainly with low-quality jobs (with poor wages and low productivity) and a range of labour-based survival strategies, more recently activities have been arising in various areas that display a mounting demand for skilled labour and increasing integration into global value chains. More and more, this is bringing about the geographical decentralization of these activities worldwide, and thus trade has expanded at a faster rate in services than in goods. However, although the Latin American and Caribbean region has formed part of this process with expanding exports, generally speaking it has done so in less dynamic activities. This document examines some of the traits of this process and explores the options for improving the export sector's profile by promoting services exports with a higher technology content, particularly business services.

In the openings for competitiveness and learning mentioned, there are crucial trans-sectoral windows of opportunity opening with the new paradigms (Pérez, 2008). With hypersegmented markets, increasingly specific demands on the part of consumers and the application of new technologies across the economic system, there are opportunities to apply and develop new knowledge in practically all branches of activity (industry, natural resources and services). But taking advantage of those opportunities requires massive efforts. What is more, the capacities needed to learn and innovate with the new paradigms depend partly on firms and countries having built up and consolidated capacities —as well as a large stock of human capital and scientific and technological infrastructure— in the previous paradigm. For example, biotechnology is based to a large extent on chemistry and nanotechnology on electronics. To transform opportunities into real conquests takes a considerable effort and means shifting the profile of the production structure towards activities that can generate and propagate innovations in the framework of the new paradigms. Technical progress and structural change, as discussed in chapter II, work in synergy with each other.

The following sections look more deeply into these topics, paying particular attention to the manufacturing industry, agriculture, mining and services. The different sections deal with the specific traits of each sector from the points of view of technology and patterns of competition and international integration and special attention is devoted to the potential effects of the new technologies in each. An effort is made to better identify the openings available in each sector (which are defined by the combination of learning areas and competitiveness) and to pull together the microeconomic, sectoral and macroeconomic levels of the enquiry. Bearing in mind that opportunities for upgrading in each sector depend, to a great extent, on the value chains of which these sectors are part, the last section proposes a taxonomy for such global value chains, showing their main features and the possibilities they offer in the context of the countries' capacities.

A. Learning patterns in the manufacturing industry

This section analyses the current state and potential of the industrial sector in Latin America and the Caribbean. Initially, industrial development in the region was oriented towards the domestic market, although in the last two decades there has been a partial shift towards the international market and maquila activities. The nature of this industrial development has been the object of ongoing debate on how industrial policy should act when, on the one hand, the countries have a great comparative advantage (specialization) in natural resources and resource-based manufactures and, on the other, several of the region's economies, especially the large and medium-sized ones, have a fairly large and relatively developed industrial apparatus.

The domestic-market-oriented industrialization process enabled the creation of an industrial fabric and a base of technological capacities for producing manufactures in the different segments of industry. Part of the learning processes in this import substitution period was the building of capacities and business structures that were later fundamental in absorbing the impact of external trade liberalization and redirecting the international competitiveness of part of the industrial apparatus. This production base suffered the onslaught of economic opening and competitive pressure from other countries which, by sheer scale, gained increasing shares in the international markets. As a result, today's manufacturing sector has certain traits that set it apart from that of several decades ago; and one of the main differences is the quantity of exports.

More recently, the Central American countries (Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua), Mexico and the Dominican Republic, which will be referred to as the "subregion", have adopted notably similar patterns of production specialization, broadly consisting of measures to attract foreign firms to set up platforms to export manufactured goods, mostly to the United States market. These firms have been attracted by different regimes of fiscal incentives, such as maquila schemes,[2] free zones or temporary admission. The main object of this analysis, however, is the export manufacturing industry (IMANE) that functions under such regimes, and the rest of this chapter will therefore use this term instead of the narrower "maquila".[3]

The evidence found suggests that, overall, the export manufacturing industry still displays productivity gaps with respect to the rest of the manufacturing sector and the wider economy; also, little progress has been made in developing production processes with greater value added and productive linkages.[4] However, in certain niches of the textile, automotive and electrical industries, including, recently, some new ones such as medical and aerospace equipment, there have been experiments with new models of production organization and heightened efforts to develop or consolidate supplier bases and to increase interaction with institutions promoting production and technology. So there are advances in the subregion which, though isolated, are indicative of considerable development potential.

The first part of this section examines the industry's trajectory from four perspectives: the pattern of the manufacturing industry's participation in the economies of the region since the 1990s, industrial export dynamics, the share of manufactures in total exports and the structure of manufacturing exports by technology intensity. The second part summarizes the main trends in the collective performance of the IMANE, particularly in reference to value added, employment and exports. The learning patterns and dynamics are analysed by main segment and the different opportunities arising in some of them (textiles and garment assembly, automotive and autoparts, electronics) are examined.

1. Industrialization and international integration

Figure V.1 shows how the manufacturing sector's share in value added has performed in the different countries of the region. As noted in chapter II, the manufacturing sector has lost ground in this regard over the last two decades. The industrialization coefficient of the region overall has dropped slightly in the 15 years examined, and this ties in with the long-term downtrend in the share of tradable goods segments and uptrend in that of services, as discussed in the work of Stallings and

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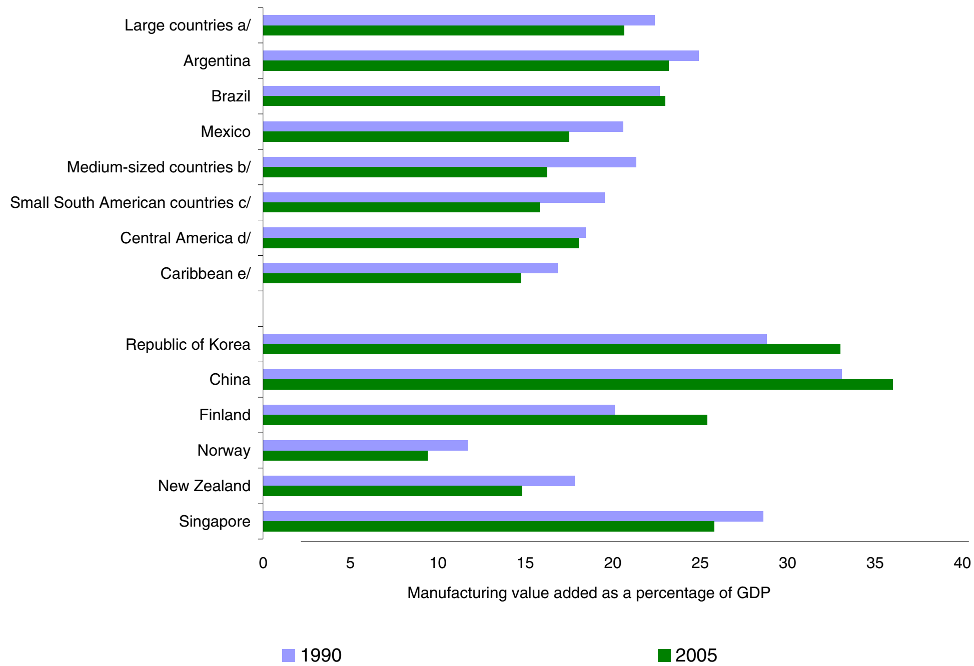
2 The countries studied do not have a single definition or concept for this activity, but broadly speaking the narrower term of "maquila" refers basically to a productive activity in which the producer does not own either the raw material employed in the process nor, sometimes, the equipment and machinery used. The term is Arabic in origin and denotes the portion of grain, flour or oil charged by the miller in payment for milling work (Buitelaar, Padilla-Pérez and Urrutia, 1999).

3 There are two main traditional or narrow meanings of "maquila": one refers to the special fiscal regimes for promoting exports (programmes); the other involves forms of production organization based on abundant (and usually cheap) labour operating in clusters (processes). The term "IMANE" is broader and not limited to a particular export promotion programme. In this content, therefore, IMANE includes export manufacturing activities that benefit from temporary import programmes, some of which may be similar to maquila schemes while others have specific features of their own.

4 See an analysis of the case of Mexico in Dussel Peters (2000) and Capdevielle (2005).

Peres (2000). Only in Brazil and a few Central American economies has there been a small increase in industry's relative share.

Figure V.1
INDUSTRIALIZATION COEFFICIENT, 1990 AND 2005
(Manufacturing value added as a percentage of GDP)



Source: United Nations Industrial Development Organization (UNIDO) and Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of national accounts.

[a] Argentina, Brazil and Mexico.
[b] Bolivarian Republic of Venezuela, Chile, Colombia and Peru.
[c] Bolivia, Ecuador, Paraguay and Uruguay.
[d] Costa Rica, El Salvador, Honduras, Nicaragua and Panama.
[e] Antigua and Barbuda, Barbados, Belize, Dominica, Dominican Republic, Guyana, Jamaica, Saint Lucia, Saint Vincent and the Grenadines, Suriname and Trinidad and Tobago.

Several points arise with respect to these data. The first is that the industrialization coefficient —averaging around 20% in the period 1990-2005— suggests the existence of a relatively developed industrial apparatus in the region's countries. Although this apparatus is comparatively smaller than that of economies that specialize heavily in industry (for example, China, the Republic of Korea and Singapore), it is larger than that of others that specialize basically in natural resources, like Norway or New Zealand. The second point is that, in the middle of this decade the size of the manufacturing sector relative to the economy formed a distinct pattern: the large countries (excluding Mexico) have an industrialization coefficient of over 20%, while the medium-sized and small countries of South and Central America show a coefficient that ranges from 15% to 20%, and that of the Caribbean countries is below 15%. The group of countries with higher coefficients includes not only large economies, but also a few smaller ones, and this variety is also reflected in the fact that the group encompasses some of the region's longest-industrialized economies, as well as others that have industrialized much more recently. Also notable is the absence from this more industrialized group of some countries that have a long history of industrial development, particularly Mexico and Colombia, whose coefficient has dropped considerably, especially in the 1990s (Stallings and Peres, 2000).

In the period following economic reform, the existing industrial apparatus became much more internationally integrated, albeit starting from different levels of development. This is reflected in the behaviour of the manufacturing industry's export coefficient, measured as the coefficient between exports and the sector's gross output (see table V.1).[5] Although the data for 1970 may reflect the performance of only a few segments, especially in small economies, a few very clear conclusions may be drawn. In the larger and more industrialized economies (Argentina, Brazil and Mexico), and in some medium-sized ones (Colombia), the coefficient was very low and remained virtually constant in the 1970s and, in the case of Brazil, until 1990. After a decade of adjustments in the 1980s, exports began to climb strongly as a proportion of industrial output in almost all the countries for which quantitative information was available.[6] This happened both in countries with a strong domestic-market orientation —such as Brazil, where the coefficient doubled between 1990 and 2003— and in those that focused more on the external market, whether by assembling imported parts and components (Mexico and Central America) or under other export regimes (Chile, Colombia and Peru, whose coefficients doubled or even tripled with respect to the pre-reform period).

Table V.1
EXPORT COEFFICIENTS OF THE MANUFACTURING INDUSTRY, 1970-2003
(Percentages of the sector's gross output)

	1970	1981	1990	2001	2003
Argentina	4.6	4.5	10.2	13.7	25.4
Bolivia	33.7	26.4	16.8	28.9	
Brazil	7.1	9.2	9.6	17.3	18.3 [a]
Chile	26.3	15.8	25.8	27.4	30.4 [a]
Colombia	3.2	6.1	10.7	20.6	20.1 [a]
Costa Rica	16.7	27.3	24.6	...	...
Ecuador	8.1	10.2	6.9	...	...
El Salvador	19.4	24.1	13.9 [b]	...	...
Guatemala	...	26.1	47.0	...	...
Honduras	...	...	14.7	...	...
Mexico	3.4	3.0	9.6	45.1	46.2 [a]
Nicaragua	33.5	24.9	...	...	...
Paraguay	17.6	4.6	12.2	...	...
Peru	21.3	9.1	8.6	13.8	15.7
Uruguay	13.6	15.1	22.0	20.9	...
Venezuela (Bol. Rep. of)	20.3	10.2	33.7	...	...

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of the Industrial Performance Analysis Program (PADI), 2005.

[a] Data correspond to 2002.
[b] Data correspond to 1991.

Industry's increasing external-market orientation has resulted from a combination of two factors. One is the strength of economic signals arising from the liberalization of external trade, which have shifted relative profitability towards the external market. The other is the solidity of the previous learning processes which provided a basis on which to adjust and reorient the industrial apparatus; although in the less competitive segments this process took place on a smaller scale and involved less product differentiation, it became consolidated around a more internationally competitive nucleus. Although it is

[5] The export coefficient is influenced by variations in the real exchange rate, since manufactures are basically internationally tradable goods.
[6] For a detailed analysis of the long-term behaviour and adjustment processes in the manufacturing sector see Clavijo and Casar (1994) for the case of Mexico; Coutinho and Ferraz (1994) for Brazil; and Kosacoff (2008) for Argentina.

a difficult process to document, it followed a relatively common pattern in the more industrialized countries of the region. The domestic-market-oriented industrialization process helped to build capacities and business structures by increasing the domestic content in output. In some cases, this led to or necessitated production in certain segments that lacked adequate conditions of scale and product or process differentiation. The essence of the adjustment process was to substitute less efficient inputs, components and segments with imported equivalents, which paved the way for much greater export of industrial goods based on the combination of imported elements with competitive national components. This was very marked in the automotive industry, in which, though local content per production unit decreased, the scale was multiplied from a few hundred thousand vehicles to over 1 million units per year in Brazil and Mexico.

Two diametrically opposing propositions have been put forward with respect to this process. They are both wrong. One is that it was an error of policy to build an industrial apparatus since this forced the economy in the opposite direction from the one its factor endowments would seem to recommend. The other is that the reform process and associated adjustments destroyed industry, dismantled productive chains and swept away technological capacities. Both affirmations are true in just measure, but false when taken to the extreme. It is clear from the sector's adjustment and reorientation experience that the industrial learning process helped to create competitive advantages beyond mere factor endowments. If the industrial apparatus had not built up those capacities, the adjustment would not have been possible; it simply would not have occurred. The dismantling of productive chains must also be judged in relative terms. Not only were there few of them, even in the larger and more industrialized economies, but the increase in industrial output certainly exercised a greater pull —absolute, not relative— on domestic demand. So, even supposing that the national content index had been 60% or 70%, there could not have been more linkages with the rest of the economy when Mexico exported manufactures to the value of US$ 3 billion in the early 1980s than now, when it exports more than US$ 200 billion, even if those exports overall have a national content of just over 20%, as those of the maquila industry do. The intermediate point is correct: in the period in which production was oriented towards the domestic market, the industrial sector developed with flaws, but also with capacities built into firms that enabled them to adjust and shift their focus towards the external market.

Accordingly, despite the increase in exports of natural resources in the middle of the current decade, the manufacturing sector's share in exports is still high and, in most of the countries, actually continued to climb between 1990 and 2006 (see table V.2). Here again, the international comparison shows an intermediate position between the countries specialized in industrial activities, with a manufacturing share in exports of around 90% or higher, and those which specialize more intensively in natural resources, with shares similar to or lower than those of the region. Above and beyond this indicator, however, the point is to identify the technological quality of exported products, and there some surprises arise.

The structure of manufacturing exports reveals a considerable technological content and an increase across the board in products that the literature treats as mid-level- and high-technology (see table V.3); exports of natural-resource-based manufactures and low-technology products also figure. This fact is usually offset with the argument that it is due to maquila activities, which concentrate on the less technology-intensive stages (assembly) of the making of products which are in themselves high-technology, such as computer and communications equipment. But at a deeper level of detail, it is evident that the increase in the share of mid-level- and high-technology products seen in Mexico, Costa Rica and other Central American and Caribbean economies also occurs in countries that do not specialize in the export manufacturing industry, such as Brazil, Argentina or Colombia. Indeed, Brazil's export manufacturing structure is not technologically inferior to China's, although it lags behind star countries, such as Singapore and the Republic of Korea and is far ahead of India's. The export manufacturing industry in Argentina and Colombia is not technologically inferior to Norway's, though it is to Finland's, and it is well ahead of New Zealand's (ECLAC, 2007g).

Table V.2
MANUFACTURES AS A PROPORTION OF TOTAL EXPORTS, 1990 AND 2006
(Percentages of the total)

Groups	Intraregional		Extraregional		To the world		Groups	World	
	1990	2006	1990	2006	1990	2006		1990	2006
Latin America and the Caribbean [a]	65.6	77.2	48.4	60.5	50.8	63.4	Reference countries	74.7	88.4
Large countries [b]	78.6	84.0	59.3	73.3	61.7	75.0	Australia	37.3	37.1
							China	79.4	97.3
Medium-sized South American countries [c]	51.4	69.5	32.1	31.5	34.8	37.7	Finland	98.4	98.3
Small South American countries [d]	30.8	40.1	21.1	18.9	24.3	27.2	Republic of Korea	97.1	99.4
Central America [e]	84.4	86.5	22.3	52.5	36.7	62.5	New Zealand	49.0	58.4
Caribbean [f]	89.9	87.0	55.1	54.8	58.5	60.2	Norway	51.2	30.2

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of United Nations Commodity Trade Database (COMTRADE).

[a] Weighted average of 27 countries.
[b] Argentina, Brazil and Mexico.
[c] Bolivarian Republic of Venezuela, Chile, Colombia and Peru.
[d] Bolivia, Ecuador, Paraguay and Uruguay.
[e] Costa Rica, El Salvador, Honduras, Nicaragua and Panama.
[f] Antigua and Barbuda, Barbados, Belize, Dominica, Dominican Republic, Guyana, Jamaica, Saint Lucia, Saint Vincent and the Grenadines, Suriname and Trinidad and Tobago.

Table V.3
MID-LEVEL- AND HIGH-TECHNOLOGY PRODUCTS AS A PROPORTION OF TOTAL EXPORTS, 1990 AND 2006
(Percentages of the total)

Groups	Intraregional		Extraregional		To the world		Groups	World	
	1990	2006	1990	2006	1990	2006	1990	2006	1990
Latin America and the Caribbean [a]	43.4	45.8	34.6	61	36.2	58.4	Reference countries	42.6	60.3
Large countries [b]	53.1	59.3	43.9	69.5	45.4	68.2	Australia	35.6	40.8
							China	33.7	57.8
Medium-sized South American countries [c]	28.8	26.7	9.9	9.8	13.8	15.6	Finland	41.4	54.8
Small South American countries [d]	25.5	28.2	2.7	14.0	12.3	21.9	Republic of Korea	52.8	75.0
Central America [e]	35.6	34.1	10.8	57.5	24.0	47.3	New Zealand	21.5	28.9
Caribbean [f]	25.3	18.4	19.8	21.8	20.6	21.1	Norway	42.8	39.0

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of United Nations Commodity Trade Database (COMTRADE).

[a] Weighted average of 27 countries.
[b] Argentina, Brazil and Mexico.
[c] Bolivarian Republic of Venezuela, Chile, Colombia and Peru.
[d] Bolivia, Ecuador, Paraguay and Uruguay.
[e] Costa Rica, El Salvador, Honduras, Nicaragua and Panama.
[f] Antigua and Barbuda, Barbados, Belize, Dominica, Dominican Republic, Guyana, Jamaica, Saint Lucia, Saint Vincent and the Grenadines, Suriname and Trinidad and Tobago.

In almost all the Latin American and Caribbean countries, the share of manufactures in total exports is significantly higher for exports to other countries of the region, showing how important intraregional trade is in lifting the quality of exports. This has been particularly evident in the cases of Argentina, Brazil and Uruguay (MERCOSUR), Bolivarian Republic of Venezuela, Colombia and Ecuador (Andean Community), Guatemala, Honduras and Nicaragua (Central American Common

Market), and Dominica, Jamaica, Trinidad and Tobago and Saint Vincent and the Grenadines (Caribbean Community). Underlying these virtuous dynamics are the complementation of domestic efforts with the results of long-standing trade integration processes, which have opened up spaces for capacity-building and learning in order to expand manufacturing exports including, in some cases, higher technology ones.

The picture, then, is similar to the previous panorama. The region has an industrial apparatus associated with two drivers: one is the industrialization initially oriented towards the domestic market and then partially redirected towards the international markets, especially other Latin American and Caribbean countries; and the other is the IMANE. Both spheres tend to intensify specialization in mid-level- or high-technology products, with different degrees of linkages with the rest of the national economy.

Table V.4 shows the mid-level- and high-technology products that have increased as a share of total exports between 1990 and 2004 in 11 countries of the region. Three patterns stand out.

Table V.4

LATIN AMERICAN "HI-TECH" [a] EXPORT PRODUCTS WITH A RISING SHARE IN OECD IMPORTS, 1990-2004

(Percentages of total exports)

	Chemicals [b]	**Machinery and electronics** [c]	**Transport** [d]	**Others** [e]	**Total**
Argentina	2.47	...	3.57	...	6.04
Brazil	0.63	3.40	5.16	...	9.19
Chile	1.67	0.42	...	...	2.09
Colombia	4.51	0.79	1.55	1.31	8.16
Costa Rica	0.26	44.96		4.13	49.35
Ecuador	0.89	0.10	0.93	0.30	2.22
El Salvador	0.28	1.01	...	0.43	1.72
Mexico	0.64	10.27	6.36	2.56	19.83
Peru	0.57	0.26	...	...	0.83
Uruguay	1.74	0.26	0.68	0.49	3.17
Venezuela (Bol. Rep. of)	1.20	...	0.47	2.15	3.82

Source: Economic Commission for Latin America and the Caribbean (ECLAC)/World Bank, TradeCAN [database], 2006.

[a] Refers to the mid-level and high technology manufacturing classifications whose market share increased and which 2006.
[b] Refers to divisions 51, 53, 54, 55, 56, 58 and 59 of SITC Rev.2.
[c] Refers to divisions 71, 72, 74, 75, 76 and 77of SITC Rev.2.
[d] Refers to divisions 78 and 79 of SITC Rev.2.
[e] Refers to divisions 67, 81 and 87 of SITC Rev.2.

First, those products are concentrated in two subsectors: the chemical industry and transport equipment, behind which there is a long history of effort and, in several cases, industrial policy, including in the framework of intraregional trade agreements (pharmaceutical products, motor vehicles and autoparts, aircraft) (see box V.1).[7] The nature of the corporate stakeholders is very diverse in these industries, which suggests that there are opportunities for differentiated corporate strategies. In the automotive industry, the subsidiaries of transnational companies predominate totally in terminals and assembly plants, while in the production of vehicle parts the predominance is shared, since there are also some large locally-owned groups (Mortimore, 1998; Unger and Oloriz, 2000). The chemical industry has a complex structure in which certain activities are controlled by local conglomerates and others by transnational companies; in both cases, as in the aeronautics industry in Brazil, a number of the leading firms today were State-owned at one time (Coutinho and Ferraz, 1994; Máttar, 1994).

[7] For a review of industrial policy in the region, see Peres (2006) and Suzigan and Furtado (2006).

Second, but closely tied to the previous point, is the observation that the larger economies show a greater diversity of the products in question, with this being particularly true in the cases of Argentina, Brazil, Colombia and Mexico; in two of these, Brazil and Mexico, there are various subsectors producing machinery and equipment. Third, once again, the activities of the maquila sector or the broader IMANE (see section 2) stand apart somewhat; this is illustrated by the extreme case of Costa Rica, but the point is naturally also valid for Mexico and the rest of Central America and the Caribbean.

Briefly, then, the size of the economy, the experience of industrialization, regional integration and access to maquila activities are determinants of differences in manufacturing export structure, and in industrialization coefficients and manufacturing exports. Since the first of these four variables is a measurable fact, the other three offer possible routes for the expansion of manufacturing activities: to intensify industrialization in the subsectors where it is possible, increase technology density, strengthen the articulation of the IMANE with the other branches of industry and deepen regional integration.[8]

Box V.1

PUBLIC POLICIES FOR CAPACITY-BUILDING: THE ARGENTINE NUCLEAR INDUSTRY AND THE BRAZILIAN AEROSPACE INDUSTRY

The region offers two iconic examples illustrating the role of public policies in acquiring or developing technological capacity. The first is the Argentine nuclear industry and the second the Brazilian aerospace industry, both in the high-technology segments. In both cases, relevant public policies were implemented to finance the set-up of the industry and ensure its sustainability; the motivation to create them did not come from the private sector and the innovation-investment sequence started with the government's decision to adopt active and specific policies to create a particular institutionality and then to acquire related capacity and foster the conditions for other entities to materialize.

Argentine nuclear industry. The effort to acquire the technological capacity to build nuclear reactors in Argentina dates back to 1950, when the National Atomic Energy Commission (CNEA) was created. This was followed in 1976 by Investigaciones Aplicadas (INVAP), which was formed under an accord between CNEA and the government of Río Negro province. INVAP is now a public high-technology company devoted to research and development (R&D) in highly complex areas, such as nuclear energy, space technology, industrial technology and medical and scientific equipment. By implementing specific public policies, the government made it a priority to form and acquire capacities in the area of atomic energy; this was the reason for creating CNEA as an autonomous institution endowed with financial resources, to carry forward investment, develop related know-how and set up several nuclear plants in the country (Teitel, 2007). The result of these efforts aimed at nuclear energy has been the formation of a technological cluster in the region of Río Negro. The firms that form the cluster do not mass-produce standardized products or services, but provide engineering services and manufacture short series of the resulting products. This manufacturing normally requires intensive know-how and use of specific technical knowledge and some time spent on the learning curve. The main competitive advantage for local firms lies not in productivity, scale or costs, but generally in the technological capacity to develop, produce and supply services in specific niches. Generically, the main activities of Bariloche's technology industry relate to the nuclear, space and engineering industries or to assembly in metallurgy, renewable energies and information technologies (Lugones and Lugones, 2004).

Brazilian aerospace industry. In Brazil, the development of the aeronautics industry began in 1945 with the establishment of the Aerospace Technical Centre (CTA) and, later, the Aeronautical Technology Institute (ITA) and the Institute for Space Research (INPE). The decision to create these institutions was taken by the governments of the time, which made the strategic development of aeronautics in Brazil a priority. The country could not rely exclusively on imports of aircraft, devices and components for national security reasons, so it was essential to create a national aeronautics industry (Goldstein, 2002). Thus, the Brazilian Aircraft Corporation (EMBRAER) was created in 1969, originally as a State enterprise, but it later took on private partners and formed cooperation agreements with the main public and private firms in the aeronautics subsector, in order to design and build new civil and military aircraft. The government's support was vital in the launch and subsequent success of EMBRAER, first through policies to protect it from foreign competition in the domestic market, then with the demand for aircraft for national defence and, lastly, through policies to promote and subsidize exports, which enabled the firm to compete in the international market.

[8] Regional integration, in turn, should be "open" (ECLAC, 1994).

Box V.1 (concluded)

EMBRAER went through different stages in its first 25 years. In the 1970s, owing to the lack of domestic capacity, the firm concentrated on the use of existing licences and on cooperation activities that enabled it to acquire new resources and know-how and to build up capacity, in order to manufacture its own planes and place them on the international market (Goldstein, 2002). However, this learning process was neither linear nor inevitable and the firm did suffer vicissitudes, such as the crisis of 1992, attributable mainly to the lack of financing, which led to its privatization in 1994. Thanks to a large injection of resources, the sale of part of the company and changes in production and in productive and organizational processes, in 1998 EMBRAER began to turn a profit, after 11 consecutive years of net losses. Since its restructuring, EMBRAER has again become a firm capable of exporting planes of all types (commercial, executive and defence) to the world's most competitive markets. It also has bases in the United States, Europe and China. As regards the volume of exports, EMBRAER is one of Brazil's largest exporters and in 2006 contributed 2.3% of the net trade balance.

Although the cases and the trajectories of INVAP and EMBRAER are different, they share certain features. Both were created by public policy decision, with the analogous development of the respective institutional structure; this, in turn, was endowed with the human and financial resources to enable the initial development of the nascent industries, which helped to generate the technological and innovation capacities directly associated with their future development. In both cases, too, the basic policy was complemented with additional public policies to support these firms' national and international activities, and to facilitate the formation of areas of cutting-edge technology that could gain a foothold in the most competitive international markets in the world (Teitel, 2007).

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

2. Export manufacturing industry

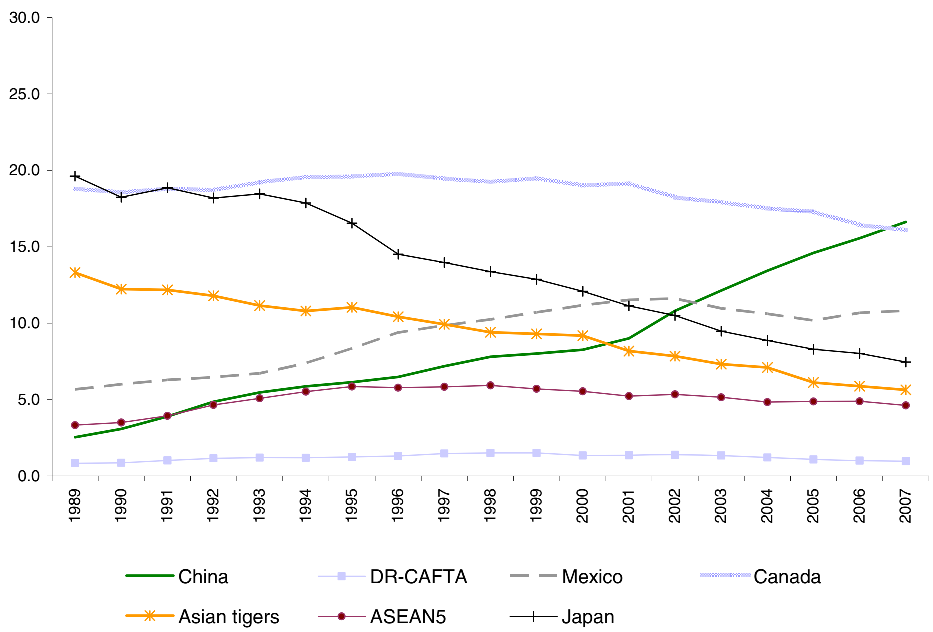
This section looks more closely at the pattern of productive specialization seen in the Central American countries (Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua), Mexico and the Dominican Republic. In these countries, firms set up platforms from which to export manufactured products, mostly to the United States market. As noted earlier, these firms are attracted by different regimes of fiscal incentives, such as the maquila export industry, free zones or temporary admission schemes. Together, these activities have been denominated the *export manufacturing industry* (IMANE, from its Spanish acronym), which forms the subject of this part of the analysis.

The comparative advantages for the establishment and growth of the IMANE in the broad sense are based on five factors. The first is geographical location: Mexico's northern border and the proximity of the Central American countries and the Dominican Republic make them prime locations for entry to the United States market, which is the main destination for these exports. The second factor is the abundance of low-cost labour. Although wages vary significantly among the countries of the subregion, they are much lower than those paid in the United States, where most of the exported goods go. The third factor is preferential access to third markets, facilitated by numerous bilateral and unilateral free trade agreements. The fourth is the fiscal incentives implemented to attract investment in production with a strong focus on external markets. Lastly, the subregion's trajectory and accumulated experience with export product manufacturing is an asset in itself; this is a factor in all the countries of the subregion (although to a lesser extent in Nicaragua), which have developed the capabilities and skills to produce to the specifications of parent companies and have participated in flexible production schemes which require faster adaptation and learning of new tasks, as in the case of "fast fashion" (Padilla-Pérez and others, 2008).

The second of these factors —low wages— has become less important in the last few years because of the increase in the United States market of imports from developing Asia, particularly China. As shown in figure V.2, both Mexico and the countries of the Dominican Republic - Central America - United States Free Trade Agreement (DR-CAFTA) have lost ground in manufacture imports (except those of primary origin) into the United States, which is basically a result of the larger market share captured by China.[9] Preferential agreements, too, have become less important as a factor of competitiveness. For example, the advantage Mexico gained over the Central American countries with the entry into force of the North American Free Trade Agreement (NAFTA) has gradually been eroded by the implementation of preferential agreements and, recently, by DR-CAFTA.

Figure V.2
UNITED STATES: MARKET SHARES OF SELECTED COUNTRIES, 1989-2007
(Percentages of total imports)

Imports of manufactured products



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of information provided by the United States Department of Commerce.

Basically, because of competition from China, maquila exports from Mexico and the DR-CAFTA countries have grown more slowly in the last five years than in the previous period, as shown in table V.5.[10] Interestingly, the only two countries in the DR-CAFTA bloc whose maquila exports grew faster than United States manufactures imports in that period (9.6%) were Nicaragua and Costa Rica. While Nicaragua's exports started from very low levels, it is curious that one feature of these two countries that distinguishes them from the others: Nicaragua and Costa Rica have the subregion's lowest and highest wages, respectively, due in the case of Costa Rica to the country's more skilled labour force. This means that Nicaragua is able to compete on the basis of low wages (at least, compared to other countries of the subregion) and Costa Rica with higher wages and more skilled labour, in addition to its participation in the value chain of the one of the largest multinationals in the electronics and high-tech industry.

[9] China's lower wage levels have also eroded the competitiveness of Japan and the so-called "Asian tigers". The difference with regard to the Latin American and Caribbean region is that although those Asian countries lost market share in the United States, they gained in exports of parts and components to the Chinese market, in many cases owing to the relocation of part of the value chains of their multinational firms.

[10] The growth rate of United States imports of manufactures during this period averaged 9.6% per year. Hence, the difference between that rate and the growth of the subregion's exports is attributable to a loss of competitiveness. Conversely, in the preceding period the subregion's exports had risen faster than United States imports, meaning they were gaining shares of the United States market (see figure V.2).

Table V.5

DOMINICAN REPUBLIC - CENTRAL AMERICA - UNITED STATES FREE TRADE AGREEMENT (DR-CAFTA) AND MEXICO: TOTAL EXPORTS FROM MAQUILA AND FREE ZONES COMPARED WITH UNITED STATES IMPORTS

(Annual average growth rates)

Countries	Maquila and free zones			Non-maquila exports			Total exports (including maquila and free zones) [a]		
	1991-1995	1996-2000	2001-2006	1991-1995	1996-2000	2001-2006	1991-1995	1996-2000	2001-2006
Mexico, Central America and Dominican Rep.	23.9	20.5	7.2	17.2	9.0	11.1	19.7	14.1	9.1
DR-CAFTA	53.9	20.9	5.6	22.8	2.3	10.5	31.7	11.3	7.6
Costa Rica	21.9	34.6	11.7	24.1	-2.4	8.6	23.5	11.6	10.3
El Salvador	48.8	20.4	1.5	21.9	6.8	9.7	29.5	13.2	5.3
Guatemala	18.3	20.7	3.2	19.8	7.4	9.0	19.4	11.3	6.6
Honduras	43.4	36.3	7.8	11.6	-2.0	10.1	16.8	13.6	8.7
Nicaragua	88.2	16.7	25.8	15.3	8.4	11.8	19.0	10.3	17.2
Dominican Rep.	5.6 [b]	11.3	0.1	20.4[b]	0.5	19.5	8.5[b]	9.1	4.1
Mexico [c]	18.4	21.1	7.8	15.9	10.0	11.0	16.8	14.7	9.5
	Imports of manufactures [d]						Total imports		
United States	12.7	11.2	9.6				11.2	11.1	11.4

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of official information from the relevant countries and United States Department of Commerce.

[a] The total includes maquila in the cases of El Salvador and Mexico, free zone and inward processing in Costa Rica and the free zones in the Dominican Republic and Nicaragua. In Nicaragua, the total corresponds to the free zone plus goods transformation activities.
[b] Corresponds to the period 1993-1995.
[c] Does not include exports under the temporary import programme to produce articles intended for export (PITEX).
[d] Does not include commodity-based manufactures.

This analysis paints a picture in which the region has lost competitiveness in the United States market, a situation which can hardly be improved through low wages alone. By contrast, competitiveness can be maintained by efforts to find niches —for example, those associated with shorter transport time to the United States market— and to increase vertical integration. Growth in exports of new non-traditional products by the subregion in the last few years (fresh fruit, vegetables, organic products) also reflects efforts to diversify exports towards other activities.

Table V.6 shows that the IMANE accounts for a significant share of total exports (61% on average in 2000-2006), which is tending to remain stable or decline in most of the countries, with the exception of Nicaragua, which shows a considerable increase. The high ratio of IMANE imports to exports (70%) testifies to the characteristics of the production process in that industry.[11] This also translates into low levels of local value added and little variation in these over time (see tables V.6 and V.7).[12]

[11] In Mexico, the concept of output value in the export maquila industry covers the amount of imported inputs plus those of local origin, as well as remunerations paid to workers and employees, including the respective social contributions, and the country's gross operating surplus. This statistic comes from the monthly survey of maquila firms conducted by the National Institute of Statistics, Geography and Informatics (INEGI). The export value corresponds to the commercial value reported by the firms when they conduct their foreign trade transactions. The value of output reflects factor costs, while the export value expresses the market price of the products or components traded. To analyse national value added as a share of the output of the maquila industry, it is recommendable to use the gross output value, since both of these reflect factor costs.

[12] The value added by the maquila industry varies considerably among countries, although the figures are not strictly comparable. The statistics available on the IMANE in Central American, Dominican Republic and Mexico have serious limitations, partly because of the lack of data and partly because of differences in accounting methodologies (ILO, 1997; Buitelaar, Padilla and Urrutia, 1999; ECLAC, 2007h and Capdevielle, 2005).

The main attribute of IMANE has been to absorb a large number of workers, and this is still the case (see table V.8). With regard to labour productivity, in Mexico the gap between IMANE and the non-maquila manufacturing industry is increasing. IMANE has absorbed labour extensively since it was created, but "there has been no virtuous change in the composition of industrial output to increase labour productivity or make it converge with that of the United States" (Capdevielle, 2005). It should be noted that although the average productivity of labour has not increased, production processes can be highly competitive and enable the manufacture of increasingly complex goods, with intensive use of technology designed and produced abroad. This confirms the importance of low-cost labour as a key factor in export competitiveness.

Table V.6
IMANE EXPORTS AND IMPORTS IN RELATION TO TOTAL EXPORTS AND CONTRIBUTION TO VALUE ADDED, 2000-2006
(Percentages calculated on the basis of current dollars)

Countries/years	IMANE exports/total exports [a]				IMANE imports/total IMANE exports [a]				IMANE value added/ IMANE exports [b]				IMANE value added/GDP [b]			
	2000	2002	2004	2006	2000	2002	2004	2006	2000	2002	2004	2006	2000	2002	2004	2006
DR-CAFTA [c]	57.4	57.8	58.3	53.9	67.6	75.4	74.0	73.7	21.7	23.7	22.8	20.5	4.0	3.8	4.2	3.7
Costa Rica	60.0	56.6	58.8	57.8	62.5	82.6	76.5	82.8	31.2	47.6	45.4	29.8	5.9	7.5	7.9	5.5
El Salvador	54.7	58.7	58.2	45.6	71.6	73.0	75.8	75.4	24.9	25.2	22.6	23.8	3.0	3.1	2.7	2.1
Guatemala	…	45.3	47.1	43.2	…	93.9	96.1	96.0	…	18.3	18.6	17.8	…	1.5	1.6	1.3
Honduras	63.1	64.8	63.3	59.6	75.6	74.9	69.5	62.7	15.4	15.0	18.3	21.0	6.1	5.6	6.5	6.5
Nicaragua	26.2	37.9	43.6	47.1	64.3	67.9	72.0	71.9	32.5	32.0	28.0	26.8	1.9	2.8	3.7	4.7
Dominican Rep.	83.2	83.6	78.9	70.0	64.2	60.2	53.8	53.7	27.3	29.1	24.2	31.6	5.4	4.7	5.1	4.0
Mexico	80.3	79.6	73.4	65.5	72.8	67.7	70.4	71.8	21.8	24.1	22.1	21.8	3.0	2.9	2.8	2.9

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of official information from the countries. The statistics were provided by the following national institutions: National Institute of Statistics, Geography and Informatics (INEGI) and the Secretariat of Economics in Mexico; Foreign Trade Corporation of Costa Rica (PROCOMER); the National Council for Free Trade Zones in the Dominican Republic; the Central Bank of Guatemala; the Central Bank of Honduras and the Honduran Maquila Manufacturers' Association in Honduras; the Central Bank of Nicaragua and the National Commission for Free Zones in Nicaragua; and the Central Reserve Bank in El Salvador.

[a] In Mexico the statistics include maquila schemes and the temporary import programme to produce articles intended for export (PITEX); in Costa Rica, El Salvador and Guatemala, free zones and inward processing; in Nicaragua and the Dominican Republic, free zones; and in Honduras, free zones and industrial processing zones.

[b] There are comparability problems among countries and over time with regard to quantifying value added in IMANE owing to the use of different methodologies and application criteria. In Costa Rica, value added corresponds to exports minus imports, plus variation in stocks, minus remittances, taxes and fees paid abroad. In Guatemala, El Salvador and Nicaragua it is calculated as the difference between exports and imports. In Honduras it is reported as gross value added, which corresponds to the sum of wages, social contributions, taxes and other rents. In the Dominican Republic it is the value recorded in the national accounts. In Mexico, IMANE value added corresponds to the value added of the export maquila industry (not including PITEX) and is calculated as the sum of remunerations, raw materials, national containers and packaging used, miscellaneous expenses and gross profits.

[c] The figures for the Dominican Republic and Costa Rica correspond to 2005.

Table V.7
MEXICO: VALUE ADDED (VA) OF THE MAQUILA INDUSTRY BY COMPONENTS OF THE GROSS VALUE OF OUTPUT (GVO), 1980-2006 [a]
(Percentages)

Year	Imported inputs/GVO IMANE	VA IMANE/ IMANE GVO	Local inputs/IMANE GVO	Wages/ IMANE GVO	Other expenses/IMANE GVO	Profits/IMANE GVO
1980	69.3	30.7	1.2	18.2	6.2	5.1
1985	75.1	24.9	0.7	12.8	6.6	4.8
1990	74.8	25.2	1.3	13.0	6.8	4.1
1995	80.8	19.2	1.4	9.4	5.6	2.8
2000	75.6	24.4	2.4	12.4	6.9	2.7
2001	73.1	26.9	2.6	13.5	7.5	3.3
2002	73.1	26.3	2.9	12.8	7.3	3.3
2003	75.0	25.0	2.5	11.5	7.7	3.3
2004	76.9	23.1	2.4	10.7	7.1	2.9
2005	76.4	23.6	2.7	10.9	7.0	3.0
2006	76.7	23.3	2.8	10.5	6.7	3.3

Source: Economic Commission for Latin America and the Caribbean (ECLAC), Evolución de la industria manufacturera de exportación en Centroamérica, México y República Dominicana durante 2000-2006 (LC/MEX/L.845), Mexico City, ECLAC subregional headquarters in Mexico, December 2007, on the basis of information provided by the National Institute of Statistics, Geography and Informatics (INEGI).

[a] Value added does not include the temporary import programme to produce articles intended for export (PITEX).

Table V.8
EMPLOYMENT IN IMANE, 2000-2006
(Thousands of individuals)

	2000	2002	2004	2005	2006 [a]
Costa Rica [b]	28	35	36	39	43
El Salvador [b]	83	84	86	81	80
Guatemala [b]	...	...	...	128	144
Honduras [c]	107	106	120	125	130
Nicaragua	37	46	66	75	81
Dominican Rep.	195	171	190	155	148
DR-CAFTA [d]	449	441	497	604	626
Mexico [c]	2 615	2 151	2 259	2 337	2 404

Source: Economic Commission for Latin America and the Caribbean (ECLAC), Evolución de la industria manufacturera de exportación en Centroamérica, México y República Dominicana durante 2000-2006 (LC/MEX/L.845), Mexico City, ECLAC subregional headquarters in Mexico, December 2007.

[a] Preliminary figures.
[b] Includes free zone and inward processing regimes.
[c] Includes maquila and the temporary import programme to produce articles intended for export (PITEX); in the latter case, figures correspond to estimates by the Ministry of the Economy of Mexico.
[d] The figures for 2000-2004 do not include Guatemala because there was no information available.

Table V.7 shows the distribution of value added in Mexico in greater detail and for a longer period. It may be seen that the ratio of value added to the gross value of output has not increased in aggregate terms and local inputs continue to account for a relatively small share. As discussed further on though, a breakdown of IMANE activities by segment reveals that this average masks quite large differences.

Job creation has suffered from the competitiveness losses caused by China's growing presence and from the effects of the economic slowdown in the United States. In the period 2000-2006 the number of jobs decreased in Mexico, El Salvador the Dominican Republic, but increased in Costa Rica, Honduras and Nicaragua. In the same period, average wages in IMANE (measured in dollars) rose in almost all the countries examined, especially in Costa Rica and

Guatemala, where they reached average growth rates of 7.4% and 5.4% per year, respectively. Only in the Dominican Republic were wages lower in 2006 than in 2000, owing to the effects of the Dominican peso's devaluation with respect to the dollar. Nicaragua has the subregion's lowest wage levels, even though they rose at an annual average of 2% between 2000 and 2006 (Padilla-Pérez and others, 2008).

In short, examination of the aggregate data for the sector support the affirmation that IMANE is very important to the subregion because of its capacity to create employment and its significant weight in exports. Lately, the industry's main advantages have been gradually eroded by the pressure of competition from Asian countries; the adverse business cycle in the United States between 2000 and 2003 also affected the industry and something similar is likely to happen in 2008 and 2009. There are difficulties, too, in generating opportunities for upgrading that would enable greater integration with the national production structure and increase the use of inputs incorporating more local know-how.

There are reasons to consider this as a possible route to developing technological capacities, however. The international experience shows that several countries have been able to upgrade starting from considerably lower levels of value added. One example is the countries of East Asia (Republic of Korea, Singapore, Taiwan Province of China and the Hong Kong SAR), which used various schemes to promote exports as a route to higher growth. Unlike what has been observed in the subregion, those countries implemented a series of complementary and integrated policies in the framework of a long-term development model. That is, as well as encouraging exports and attracting foreign direct investment (FDI), they made great efforts to develop local technological capacities that would enable them to make better use of resources transferred through foreign trade and FDI (especially technological know-how), in order to upgrade gradually towards the creation of industries and more technologically complex activities. These countries took measures to build human capital, promote research and development (R&D) activities, attract FDI selectively and create incentives to stimulate linkages between foreign firms and local suppliers, existing or new.

(a) Sectoral patterns and building of technological capacities

At a greater level of disaggregation, table V.9 shows patterns in value added as a share of the different segments of the IMANE in Mexico. First of all, trends in value added across the segments are very uneven, as is the participation of value added in the industry overall. Value added is increasing steadily in the automotive and vehicle part subsector, and in textiles and apparel, which represent 23% and 8%, respectively, of the gross value of output. In contrast, in electronics, which represents up to 47%, there is a clear drop in value added (only 15% in 2006). Second, this pattern is not isolated from the subsectors' capabilities to generate linkages with local firms and intensify learning in production processes and products. The subsectors in which value added increases over time have a growing proportion of firms that are no longer devoted exclusively to assembly ands are beginning to use better paid human capital and more local inputs. It is sometimes even argued that the IMANE is evolving towards a new stage, in which industrial clusters are emerging to provide specialized goods and services to industry and generate linkages with local education and research institutions (universities, research centres, business associations, local government, and so on). Some authors have seen this stage as an attempt to take IMANE to a third or fourth phase in which local technological capabilities are heightened and propagated (Padilla-Pérez and others, 2008).[13]

[13] The process of upgrading can be represented schematically in terms of generations and typologies that help to characterize the relation between the different variables. Authors identify up to four generations of maquiladoras. The first (1965-1981) corresponds to "pure" maquila or traditional assembly firms that relied on low wages and intensive manual labour. The second (1982-1994) shows more diversity in terms of the origin of capital, technological level and automation, while competitiveness depends more on quality, delivery times, unit costs and labour flexibility. In third-generation maquila there are more transnational firms devoted to design, research and development, and greater intra- and inter-firm vertical integration. Competitiveness relies on process duration, operating costs and speed of manufacture. The fourth generation includes such firms as Delphi México, which carry out parent-company functions and develop their production and technological capacities by coordinating innovation, transfer and learning

The textile and clothing industry has been one of the worst affected by the internationalization of production, the market share of the Asian countries (China, in particular) and the break-down of value chains. Figure V.3 illustrates the growing presence of the less developed Asian countries, especially China, and the loss of ground of the Central American countries and Mexico, together with the more developed Asian countries, in the period 2000-2007 (Hernández, 2007).

The overall organization of value chains is dominated by buyers and it stretches from the production of fibres to the processes of design, make-up, transport and marketing (Gereffi and Memedovic, 2003).[14] Generally speaking, the foreign firms at the top of the chain control product design, define the way production processes are organized and own the brands. These activities are located mainly in developed countries and in some of the Asian countries that dominate the new technologies for the production of yarn, weaving and fabric finishing. The firms in the Latin American and Caribbean subregion are mainly local SMEs operating under maquila, temporary admission and free zone regimes. Most of them concentrate on assembly or sub-assembly and full-package production[15] to the specification of the brand-owner (Confecciones Jockey International in Costa Rica, Gildan Activewear San José in El Salvador). Box V.2 outlines some of the recent business strategies employed by these firms.

Table V.9
MAQUILA EXPORT INDUSTRY: VALUE ADDED IN RELATION TO THE GROSS VALUE OF OUTPUT, 1990-2006 [a]
(Percentages)

Sectors	**1990**	**1995**	**2000**	**2006** [b]	**Variation 1990-2006**	**Average weight in sector**
Food selection, preparation, packaging and tinning	63.9	67.3	69.3	49.7	-14.2	0.7
Assembly of clothing and other made-up goods with textiles and other materials	29.3	28.4	39.3	35.4	6.1	7.9
Footwear and leather industry	37.1	31.8	26.5	30.1	-7.0	0.6
Assembly of furniture, accessories and other wood and metal products	30.2	26.9	45.0	40.7	10.5	4.4
Chemical products	38.0	36.3	41.7	38.0	0.1	1.4
Construction, reconstruction and assembly of transport equipment and accessories	22.5	17.7	23.4	28.8	6.3	23.1
Assembly and repair of tools, equipment and parts, except electrical	22.6	23.6	25.5	25.3	2.8	1.4
Assembly of electrical and electronic machinery, equipment, apparatus and articles	22.0	18.3	20.8	15.1	-6.9	13.3
Electrical and electronic materials and accessories	22.1	13.4	17.8	15.9	-6.2	34.1
Assembly of toys and sporting articles	34.0	30.9	40.5	44.0	10.0	0.8
Other manufacturing industries	31.0	24.5	26.9	26.9	-4.1	9.9
Services	46.0	35.6	31.6	34.6	-11.4	2.4
Total maquila	25.2	19.2	24.4	23.3	-1.9	100.0

Source: National Institute of Statistics, Geography and Informatics (INEGI), *Estadística de la industria maquiladora de exportación (EME)*, Mexico City.

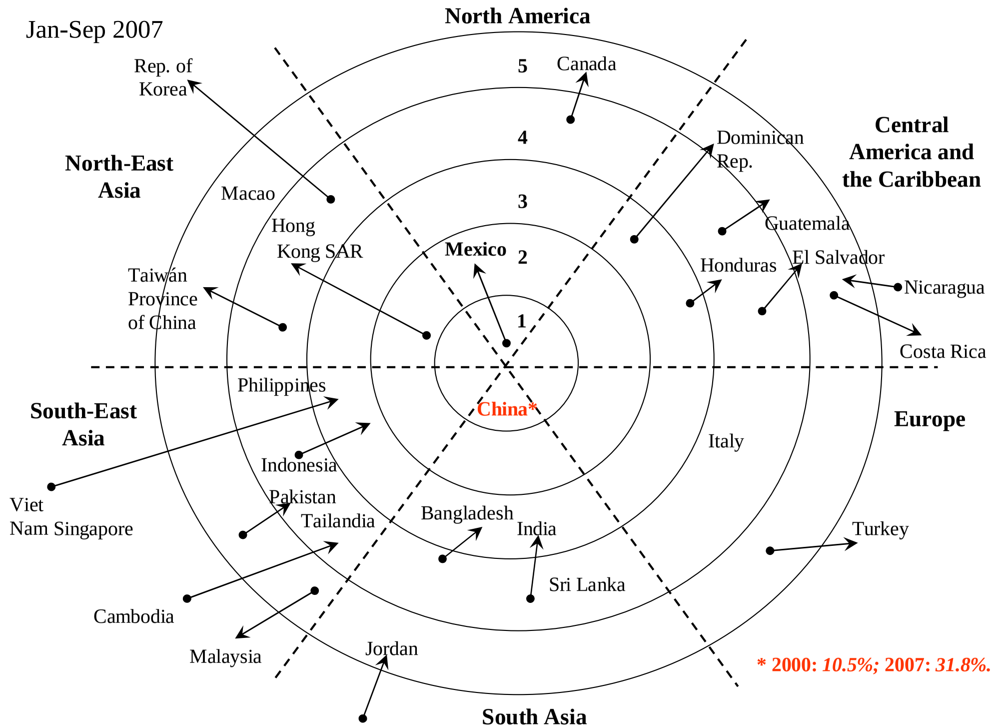
[a] The gross value of output was calculated by adding the imported inputs of the maquila industry to value added.
[b] Preliminary figures.

activities. Their main distinguishing feature is the coordination of manufacturing, research, procurement and service activities with intensive use of information technologies and telecommunications (Carrillo and Lara, 2003; Lara and Carrillo, 2003; Carrillo and Hualde, 1998, and Carrillo and Gomis, 2005).

[14] These activities all differ in intensity of factor use. For example, the production of fibres, yarns and knits requires intensive use of capital and technology to develop the raw material. This is the link of the chain where most technological progress has been made, associated with new types of fabric with specific characteristics (technical fabrics) and designed for different environments (sporting, military, security, medical or fashion). The making-up and finishing of garments are labour-intensive, while design and marketing are knowledge- and engineering-intensive (Hernández, Romero and Cordero 2006; Hernández, 2007).

[15] "Full package production" refers to any production arrangement between a client (buyer) and a contractor (manufacturer), in which the contractor is responsible for purchasing the raw materials (for example, yarn or fabric) and coordinating all the different parts of the production process (Bair and Gereffi, 2003a).

Figure V.3
MARKET SHARE OF THE TEXTILE AND CLOTHING INDUSTRY OF SELECTED COUNTRIES IN UNITED STATES IMPORTS, 2000-2007
(Percentages)



The concentric circles indicate the size of each country's share in United States imports:
(1) 10% +
(2) 6-9.9%
(3) 4-5.9%
(4) 2-3.9%
(5) 1-1.9%

The total value of textile and clothing imports was US$ 59.1 billion in 2000 and US$ 57.3 billion in January-September 2007.

The position in 2007 is shown by the position of the country's name; if a country's position in 2000 is different from the one occupied in 2007, this is indicated with a small solid circle. The arrow represents the magnitude and direction of the change in the period 2000-2007. The figure was prepared using chapters 50-63 of the Harmonized Commodity Description and Coding System, which correspond to the yarn-textile-garment chain.

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of information from the United States International Trade Commission (USITC).

Box V.2

NEW STRATEGIES IN THE CLOTHING INDUSTRY IN THE CARIBBEAN BASIN

After the end of the Arrangement regarding International Trade in Textiles on 1 January 2005 (previously the Multifibre Arrangement), the countries of the subregion had to find new sources of competitiveness to deal with mounting competition from Asia. Access to the United States market under the Caribbean Basin Trade Partnership Act (CBTPA) and DR-CAFTA has boosted the clothing industry. Also, the trend towards full-package production, shorter delivery times and enhanced quality and reliability represents great opportunities to tap into new sources of comparative advantage in the subsector. The countries have thus sought to make geographical proximity work to their advantage, heighten their attractiveness as vertically integrated suppliers and shift towards market niches that require rapid responses to changes in fashion or season.

As part of their investment promotion policies, El Salvador and other countries in the subregion set out to highlight their proximity and their characteristics as vertically integrated suppliers. The combination of a location near to the United States market and the availability of clusters of producers at various stages of the production chain has made it possible to explore specific higher-value-added niches, which require the flexibility to work with market seasonality and trends, such as high-performance sportswear. In this context, some firms that had shifted their production to Asia have returned to El Salvador (Lacoste, Benetton, Adidas, Reebok, Under-armour, Land’s End, LL Bean and others).

EL SALVADOR: VERTICAL INTEGRATION IN THE CLOTHING INDUSTRY

Segments	Firms
Dyeing	Swisstex
Fabric	Hanes, Duraflex, Petenatti
Regional distribution centres	Fruit of the Loom
Packaging	Union Plastics
Embroidery, printing, embellishment	Decotex
Design and product development centres	Designer Simple Room
Labelling	

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of a questionnaire answered by the International Promotion Agency of El Salvador (PROESA).

The experience of the Canadian firm Gildan illustrates the subregion’s competitive potential. Gildan produces unbranded T-shirts, sweat-shirts and fleece products for subsequent printing with institutional logos (of universities, schools and so forth). As part of a competitive restructuring strategy, Gildan focused on this market niche and set up a network of 40 suppliers, direct and indirect, in Central America and the Dominican Republic. It has integrated knitting, bleaching, dyeing, finishing and cutting plants in the Dominican Republic and Honduras and plans to open a third in Nicaragua; it has plants making fleece products and sports socks in Honduras and sewing operations in Honduras, Nicaragua and Haiti. The firm also uses subcontracted suppliers in the Dominican Republic and Haiti to complement its own production. Gildan’s experience shows that the Caribbean Basin countries are still attractive as nearshore locations for vertically integrated operations and testifies to the advantages of integrating operations through delocation or subcontracting, with the market access advantages provided under CBTPA and DR-CAFTA.

Another firm, Hanesbrands, announced new investments in Central America, especially in El Salvador and the Dominican Republic, despite having taken a strategic decision to focus its expansion on Asia and having announced that it would close down some operations in the subregion. Hanesbrands created hubs in El Salvador and the Dominican Republic around which to organize a series of activities. The final products are exported from El Salvador mainly to the distribution centres of large retail clients on the west coast of the United States, and from the Dominican Republic to the east coast. The firm now has 54% of its employees in the subregion, although this figure is projected to drop to around 40% over the next few years as it carries out its plan to expand mainly in Asia.

Box V.2 (concluded)

Although the bulk of the investment in the subsector comes from North America, there are also investors from other developing countries, which further goes to show the subregion's advantages. In Guatemala, the main investment announcements in the manufacturing sector include a number of plants in the garments sector: P&K Dye House (Republic of Korea), SML (China), Sandon Dyeing Textile (China, United States). Santista Textil of Brazil is investing in Honduras where, as well as access on more favourable terms to the United States market, it will benefit from the creation of a new industrial park.

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of *Foreign Investment in Latin America and the Caribbean, 200*6 (LC/G.2336-P), Santiago, Chile, 2007; questionnaire answered by PROESA (El Salvador) and Invest in Guatemala (Guatemala); Central Bank of Honduras, "Flujos de inversión extranjera directa en Honduras. Año 2006 y expectativas para el año 2007", August 2007; R. Padilla and others, "Evolución reciente y retos de la industria manufacturera de exportación en Centroamérica, México y República Dominicana: una perspectiva regional y sectorial", *Estudios y perspectivas series*, No. 95 (LC/MEX/L.839/Rev.1), Mexico City, ECLAC subregional headquarters in Mexico, February 2008; Hanesbrands 2008, Investor Day Presentation.

The learning processes triggered by purchases of new machinery or changes in production organization techniques represent opportunities for upgrading towards activities incorporating higher local technological capacities. Such a development is evident in firms that have moved towards full-package production (Textiles Lourdes Ltda. Izalco in El Salvador, Knitwear S.A. in Nicaragua, Grupo M in the Dominican Republic) and in firms that have been able to upgrade towards new functions: this implies vertically integrating their own design of new models, producing under their own brand name and taking on the marketing of their own products (Grupo Industrial Zaga in Mexico, Grupo Lovable in Honduras and Hilasal in El Salvador).[16] That such processes have become more common partly accounts for the slight increase in the sector's value added in the last 15 years (see table V.9).

In addition to the shifts described in the textile and apparel sector, the automotive and vehicle parts industry has changed in Latin America since the 1990s (see figure V.4). It has been transformed from a failing subsector, during the import substitution period, into a major exporter. In 2006, Mexico exported 1,536,768 units,[17] 29.5% more than in 2005 and the country's highest ever figure. From 12% of the manufacturing sector's total in 1994, the value added of the automobile industry rose to over 15% in 2001 and its share in the total of export manufacturing has also risen, from 18% in 2001 to 23% in 2006.

The automotive and vehicle parts industry is organized on two levels. First are the assembly firms, which assemble automobiles, trucks, tractor trailers and inter-city buses and are subsidiaries of multinationals. Ultimately, they define the mix of local and imported products as part of their overall strategies. Second are the firms that produce parts and components, which supply to the assemblers. In Mexico, some of these firms, located in the northern border region, are maquiladoras or "twin plants" (so called because there are similar ones on each side of the border), mostly of United States origin. In these plants, 93% of the raw materials come from the United States, while 90% of the industry's output is exported.[18]

16 See Gereffi, Martínez and Bair (2002); Mortimore (2002); Bair and Gereffi (2003b); Gereffi and Memedovic (2003); Carrillo, Hualde and Almaraz (2002); Dussel Peters (2004); Hernández, Romero and Cordero (2006); Hernández (2007) and Rueda Peiro (2006).

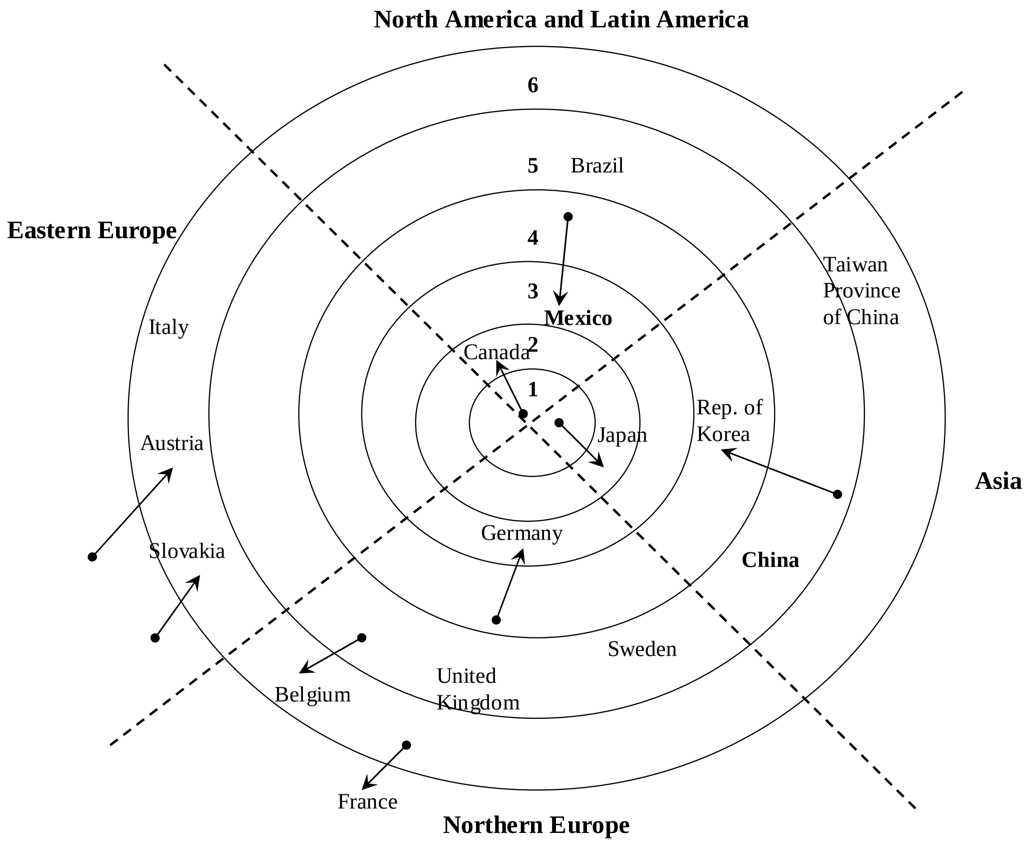
17 Includes items 41, rubber products, 56, automotive vehicles and 57, bodies, engines, parts and accessories for automotive vehicles.

18 Constantino and Lara (2000). This has made it possible to achieve higher levels of product specialization. The industry grew at an average rate of 64% in 2000-2006, with marked differences among the different sets of components. While "engines and their parts", "brakes and their parts" and "other parts and accessories" registered growth of 111%, 88% and 84%, respectively, in the same period "bodies and tyres for motor vehicles" registered negative growth of -10% and -43%.

Figure V.4

MARKET SHARE OF THE AUTOMOTIVE AND VEHICLE PARTS INDUSTRY OF SELECTED COUNTRIES IN UNITED STATES IMPORTS, 1994-2006

(Percentages)



The concentric circles indicate the size of each country's share in United States imports:
(1) 30% +
(2) 29.9-14%
(3) 13.9-10%
(4) 9.9- 5%
(5) 4.9- 1%
(6) 0.9- 0.5%

The total value of the imports of the automotive and vehicle parts industry was US$ 85.9 billion in 1994 and US$ 180.9 billion in 2006.

In the figure, the position in 2006 is shown by the position of the country's name; if a country's position in 1994 is different from the one occupied in 2006, this is indicated with a small solid circle. The arrow represents the magnitude and direction of the change in the period 1994-2006.

The figure was prepared using SITC Rev.2 codes 781 (motor cars and other motor vehicles principally designed for the transport of persons) and 784 (parts and accessories of motor vehicles).

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of information from the United States International Trade Commission (USITC).

All this offers some clues to understanding both the industrial organization of the subsector and the fact that Mexico has systems integrators and also first-tier, second-tier and even third-tier (automotive aftermarkets) suppliers.[19] Systems integrators maintain close long-term links with original equipment manufacturers (OEMs) and their function is to organize the supply chain, carry out much of the R&D activities and find technological solutions to specific problems. By doing so, they retain the intellectual property of their innovations, and this is reflected in the registration of a large number of patents every year.[20]

The automotive assembly industry in Mexico relies on business and corporate strategies at the global level, where the prevailing criteria are economies of scale, efficient use of installed capacity, and cost reduction by joining components into systems, grouping the value chain into production tiers and implementing just-in-time inventories.[21] For example, Mexico specializes in the production of vehicles and light trucks, partly because of the assembly firms' strategy of moving production platforms to Mexico to supply United States demand more rapidly, and partly because of schemes to lower production costs (Padilla-Pérez and others, 2008).

The trajectories of individual firms and plants confirm the trend shown in table V.9. The automotive and parts and components industry has integrated new local activities, which show a gradual convergence in the areas of engineering and design (Alonso, Carrillo and Contreras, 2000; Carrillo, 1997; Constantino and Lara, 2000; Mortimore and Barron, 2005; Lara and Carillo, 2003; Unger, 2006). Capacity has been built up more in production processes than in the products themselves, which is due to the incorporation of lean manufacturing techniques and just-in-time inventories. Product upgrading is much more difficult to achieve, since R&D activities remain the domain of multinational firms as the core of their competitiveness. There are obviously "islands of excellence", such as Delphi México and Visteon, which operate as global systems integrators, and there are also firms in which components manufacture and sub-assembly continue to be labour-intensive. Only through capacity-building will firms such as Grupo Alfa and Grupo DESC be able to continue competing dynamically in their respective subsector. These cases suggest that multinational firms today are more likely to subcontract manufacturing activities, but also design and distribution activities, providing that they can find technological and absorption capacities and sufficiently developed innovation systems in their host countries. The fragmentation of design and R&D activities has made it possible to geographically "delocate" those activities and place them in developing countries.

The share of the electronics subsector of a number of countries in United States imports is examined below, comparing 2006 with 1994. As shown in figure V.5, China increased its market share significantly in the United States in the period in question; conversely Japan lost ground. China also increased its share in the global electronics market to 11.5%, vying with major global competitors such as the United States, Mexico, the Republic of Korea and Germany (see figure V.5). Mexico and Costa Rica are the countries of the subregion in which manufacturing of components and electronic products account for the largest share of total IMANE activity, and in which the activity has the longest history. The vast bulk of the output of the electronics IMANE goes to the United States and, consequently, economic activity in the countries of the subregion

[19] In Mexico, according to figures provided by the National Bank for Foreign Trade (BANCOMEXT) for 2002, of a total of 875 firms producing parts and components, only 60 are first-tier suppliers.

[20] There are few global-scope systems integrators. For example, Delphi and Visteon are spin-offs of General Motors and Ford, respectively. The market for the parts and components industry is, generally speaking, segmented and has high entry barriers. However, some large Mexican firms participate successfully in it, including Grupo Alfa and Grupo DESC.

[21] First-tier suppliers are firms that provide systems directly to assemblers and that evolve into global mega-suppliers. Second-tier suppliers supply components and operate with designs provided by the assemblers or the global mega-suppliers. Third-tier suppliers provide basic standardized products and require only rudimentary engineering skills, so they compete basically through price, economies of scale and operating efficiency. The aftermarket of the motor vehicle value chain is associated with the market for spare parts and components. Firms in this segment compete mainly through price, and reverse engineering capabilities are more important than innovation skills, since the designs are copied from existing equipment. China entered the world components and parts market in this way (Padilla and others, 2008).

depends heavily on the business cycle in that country. The United States experienced low growth rates in 2001-2003 and the subregion's electronics IMANE suffered a sharp contraction. Conversely, the expansion of the United States economy in the last three years has driven the expansion of the industry in the subregion.[22]

In 2006, exports from Mexico's electronics industry reached a value of US$ 56.398 billion, which was equivalent to 23.6% of total exports, almost US$ 10 billion higher than the figure for 2000, before the industry went into recession. In Costa Rica, electronics accounted for 53.4% of free zone exports in 2006 and the activities of Intel, together with another 35 firms located mainly in the central valley, dominated the sector. In the Dominican Republic, the exports of the 27 firms accounted for 14.7% of free zone exports in 2005 and directly employed 8,900 workers.

The bulk of the worldwide electronics industry is organized in the form of global production networks, of which there are four principal categories: (i) multinational firms, OEMs or global brand leaders, such as IBM, Nokia and Sony; (ii) contract manufacturers; (iii) leading suppliers; and (iv) secondary suppliers.[23] The comparative advantages of the first two categories are based on technological capacities and capital endowments, oriented essentially towards innovation; they also have strong capabilities for coordinating transactions and knowledge exchange among different network members.[24]

The main links of the value chain in the electronics industry include R&D activities, engineering (understood as design activities to adapt and upgrade products) and detailed process engineering. Other links are components manufacturing and sub-assembly, which are capital- and labour-intensive activities, highly dispersed geographically and oriented towards the supply of specific regional markets. Assembly and sub-assembly tend to be highly labour-intensive, although they are increasingly incorporating automated equipment. The last link in the chain is marketing, which requires the set-up of distribution chains and customer services networks (Padilla-Pérez, 2005; Ornelas, 2004; Dussel Peters, Palacios and Woo, 2003).

The top of the global electronics industry is all about innovation, leading to periodic radical upgrades and short product cycles. For example, new models of personal computers are launched on the market every three months, and new consumer electronics every six months, on average. The rapid reduction of the product cycle translates into accelerated depreciation of plants, equipment and investment in R&D. This also has implications for the geographical distribution of the different links of the value chain, since new models are produced in developing countries without waiting for the product to mature and still less for it to be standardized.

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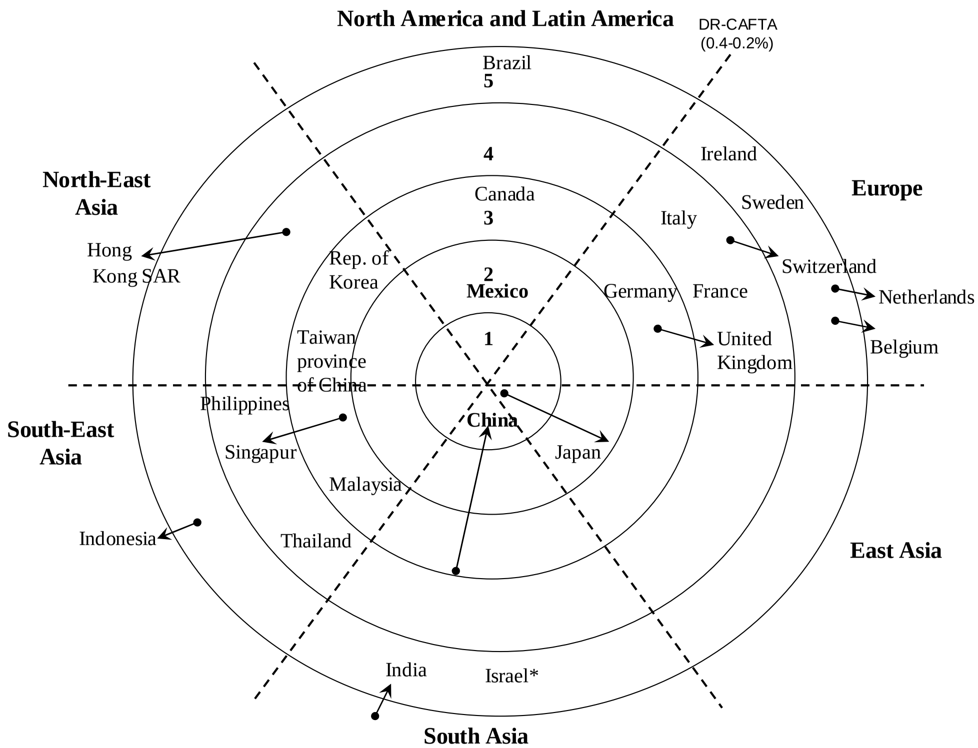
22 Germany and the United States had shares of over 10% each in the global electronics market, Japan had 8.6%, and Hong Kong (SAR of China) 5.4%. Among the Latin American countries, Mexico claimed 2.9% of the global market, followed, with less than a tenth of a percentage point, by Costa Rica, the Domincian Republic, Honduras and El Salvador.

23 This classification is based on the *Yearbook of World Electronics Data* (2002). The electronics subsector comprises five groups: (i) consumer electronics; (ii) personal computers and computer peripherals; (iii) telecommunications equipment; (iv) electronic components; and (v) industrial and medical equipment.

24 See Ernst and Kim (2001). Contract manufacturing, closely tied in with global production networks (GPNs), has expanded significantly, particularly in the personal computers segment. Contract manufacturers combine a broad range of production activities, as well as design, process engineering, procurement, distribution and even after-sales service. They usually make electronic products that are sold by original equipment manufacturers under their well-known brand names (Ornelas, 2004).

Figure V.5
MARKET SHARE OF THE ELECTRONICS SUBSECTOR OF SELECTED COUNTRIES IN UNITED STATES IMPORTS, 1994-2006
(Percentages)



The concentric circles indicate the size of each country's share in United States imports:
(1) 16.1% +
(2) 16-9.5%
(3) 9.4-3%
(4) 2.9-1%
(5) 0.9-0.5%

The total value of imports in chapters 84 and 85 of the Harmonized Commodity Description and Coding System (HS) was US$ 193.7 billion in 1994 and US$ 470.5 billion in 2006.

The position in 2006 is shown by the position of the country's name; if a country's position in 1994 is different from the one occupied in 2006, this is indicated with a small solid circle. The arrow represents the magnitude and direction of the change in the period 1994-2006.

The figure was prepared using HS chapters 84 and 85.

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of data from the United States International Trade Commission (USITC).

The local electronics maquila industry is concentrated in the labour-intensive links of assembly and sub-assembly, using automated and robotized equipment. As yet there is little design activity, although lately design departments have become more common. In the rest of the subregion by far the most frequent activities are highly labour-intensive with little local value added in production processes (see table V.9). Industrial upgrading in the electronics IMANE has taken place mainly in process technologies, owing largely to global changes in the industry, such as the introduction of automated equipment and machinery and the propagation of modern techniques of production organization (lean manufacturing, just-in-time production, the quality measurement and improvement approach known as Six Sigma, and so forth). There has been less upgrading in product technologies; nevertheless, there has been a gradual increase in design and even R&D activities (Padilla-Pérez, 2005; Ornelas, 2004; Dussel Peters, Palacios and Wool, 2003). Case studies of firms and plants show that few of them have large design or R&D departments like Intel in Guadalajara and Sony in Tijuana; the great majority are assemblers and sub-assemblers.

In Costa Rica and Mexico there are opportunities for upgrading in processes, products, functions and through intersectoral changes. Process upgrading will continue to be part of the electronics industry's global trend towards cost reduction, shorter product cycles and incorporation of new information and communications technologies (ICTs), among others. Also, as seen in Jalisco (Dussel Peters, Palacios and Woo, 2003), capacities have been developed to modify and even to create machinery and equipment (see box V.3). As for product technologies, local capacity-building and the transfer of more technologically complex activities by multinational firms can help to strengthen virtuous cycles (where they already exist) and to generate new ones. In Mexico, the convergence of learning processes in the automotive and electronics subsectors has paved the way for development in the aeronautics industry, which requires highly complex electronic components. But without efforts to strengthen innovation systems and build up local human capital and technological and absorption capacities, upgrading of functions is not a sure passport to participation in the more complex segments of the value chain (Padilla-Pérez, 2008).

Box V.3

ACTIVE INNOVATION POLICIES IN JALISCO, MEXICO

Through active policymaking, the public sector can play a key role in technological upgrading in the maquila industry. One example of this are the policies on science, technology and innovation implemented to support the electronics industry in Jalisco, Mexico. The Economic Development Department of the State of Jalisco has coordinated the design and implementation of those policies, which take the practical form of the State science and technology programme. This programme is directed towards industries, including electronics, that are seen as priorities for Jalisco. The following initiatives have had significant effects on technological upgrading in the State's electronics industry:

Integrated and selective FDI promotion policies. In the last few years, efforts to attract new multinational firms have been directed mainly towards those whose activities offer a high potential for technological spillovers. Initiatives have been put in place to strengthen linkages between multinational firms and universities and local research centres and to develop local technological capacities, so that the State can offer better conditions for FDI in knowledge-intensive activities.

Support for initiatives to strengthen technological capacities. The State government has allocated financial resources to support innovation and R&D activities, with the electronics industry being a major recipient of those funds. With the backing of further education centres, the State government has also co-funded highly specialized training programmes in areas of interest for the electronics industry, as well as the creation of high-tech incubators.

Close collaboration with the private sector. The State science and technology programme was developed in partnership with the private sector. The initiatives mentioned above are generally co-funded by leading firms and business associations, which are also actively involved in them.

The outcomes of the policies described have helped to build up a high-tech complex in Jalisco, which in 2007 consisted of 31 electronics design centres, 150 computer program firms, 12 OEMs and 13 contract manufacturers. The design centres, 21 of them locally-owned, carry out knowledge-intensive activities such as designing circuit cards, embedded computer programs and electronic products for various industries upon request. The OEMs and contract manufacturers have slowly but increasingly begun to participate in product design activities; notable in this respect are Intel and Siemens, which have R&D centres.

Source: R. Padilla-Pérez and others, "Evolución reciente y retos de la industria manufacturera de exportación en Centroamérica, México y República Dominicana: una perspectiva regional y sectorial", Estudios y perspectives series, No. 95 (LC/MEX/L.839/Rev.1), Mexico City, ECLAC subregional headquarters in Mexico, February 2008; and R. Padilla-Pérez, *Estudio sectorial de la industria electrónica en México*, Mexico City, Autonomous Technological Institute of Mexico (ITAM), 2005.

B. The agrifood complex

The agrifood complex is crucial in Latin America and the Caribbean, for a number of reasons: it makes a valuable contribution to the food supply and to food safety, generates demand for labour (18% of employment in 2005), occupies national territory (at least 50% of surface area is devoted to crop and livestock farming and the first stages of related industry), creates linkages with other sectors and activities, contributes to exports (16% of the region's total in 2005 and more than 50% in many countries) and, lastly, represents a strategic alternative energy source (ECLAC, 2007b; World Bank, 2005 and 2007; Razo and others, 2007).

The agrifood complex also has a role to play as a source of competitiveness and technological learning. Many countries' competitive advantages depend heavily on natural resources; it therefore makes sense to use these to promote learning and production diversification, as has been done in other natural-resource-rich countries that have achieved high levels of per capita income. In this connection, the technological potential of the agrifood complex must not be underestimated as a route to promoting more complex and competitive production activities, especially bearing in mind that the countries have already built up a considerable technological and productive base, as well as a corporate and even regulatory one.

In the classic typology developed by Pavitt (1984), agricultural production is "supplier dominated", as it provides primary inputs in the technological matrix. This does not mean, however, that it is a passive recipient of technology and cannot generate endogenous knowledge, nor that agricultural producers and workers can adopt technology without making an effort to learn it (Braadland and Hauknes, 2000; Christensen, Rama and von Tuzelmann, 1996; Earle, 1997; Korver, 1997; Rama, 1999; Wagner Weick, 2001; Wilkinson, 1998). In fact, the very particularity of climates and soils induces endogenous innovation (the region harbours vast experience in first advances in plant and animal genetics). The agro-industrial segment is not homogenous either. As in all industries, capacity to innovate and to transfer externalities varies within the sector, owing to both intrinsic product features and the economic agents involved (Ruttan, 2002).

There are a whole range of possible applications for biotechnology in the agrifood sector, in which Latin America plays a large role in world trade. Like any variable that has great potential to transform, biotechnology may be viewed as an opportunity or a threat. It is up to public policy to avoid possible negative effects and stimulate responses that, in combination, can strengthen the countries' competitive positions.

Although the majority of biotechnology advances have been made and continue to be made in a few research centres and corporations in developed countries, a number of public R&D institutions in Latin American and Caribbean countries have made scientific and technological contributions since the mid-1950s. Since the networks and nodes of these institutions are located mainly in developed countries, however, the respective technologies are not transferred automatically, and this creates broad openings for local development.

There are a number of reasons why more local learning efforts are needed. One is that genetic alterations in plants and animals generate responses and performances that are highly sensitive to the particularities of soil and weather. As there is no single response, evaluation must necessarily take place in local conditions. In other words, endogenous progress and the adaptations made in each country are key complementary assets: without them, imported technology will simply not yield the desired results. Something similar happens when biotechnology is applied to food production and to the development of vaccines and livestock breeding. Also, importantly, the local learning trajectory is driven and speeded by complementary capacities pertaining to the technological, productive and commercial base developed in the region, which includes seed industries, producers of cattle or sheep genetics, pharmaceutical laboratories, food fermentation industries, production of enzymes and cultured dairy products, brands, marketing channels and logistics routines (Bisang, Campi and Cesa 2007; Gutman and Lavarello, 2007).

1. Innovation and learning in the agrifood complex

(a) Main features of the agricultural sector

Although agricultural production has declined as a proportion of output in the last three decades, it still represents 6.5% of the GDP in the region; this average masks large disparities between countries, however. Table V.10 illustrates the huge differences among the countries as regards the relative importance of agriculture, in terms of both GDP and agricultural and agro-industrial exports. Between 1990 and 2005 agriculture represented over 10% of GDP in a considerable number of countries (Bolivia, Colombia, Ecuador, Paraguay) and even 20% in others (Guatemala, Guyana, Haiti). In other countries, it has remained virtually stable (Mexico, Bolivarian Republic of Venezuela, Antigua and Barbuda, Bahamas, Barbados, Grenada and Trinidad and Tobago). The table also shows the importance of agro-industrial exports in a number of countries, including Argentina, Brazil, Paraguay, El Salvador and Guyana, where these goods represent over 10% of the value of exports.

Table V.10
LATIN AMERICA AND THE CARIBBEAN: CONTRIBUTION OF THE AGRICULTURAL SECTOR TO OUTPUT AND EXPORTS
(Percentages)

	Proportion of GDP [f]		Proportion of 2005 exports [g]	
	1990	2005	Agricultural	Agro-industrial
Large countries [a]	5.9	6.3	17.1	10.3
Medium-sized countries [b]	10.1	8.3	11.2	4.1
Small South American countries [c]	11.1	12.4	39.9	6.9
Central America [d]	18.7	16.2	29.0	12.0
Caribbean [e]	14.4	11.3	17.9	18.4
Latin America	10.1	9.9	19.3	9.9
Latin America and the Caribbean	8.2	7.9	19.3	9.7

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of official figures and United Nations Commodity Trade Database (COMTRADE).

[a] Argentina, Brazil and Mexico.
[b] Bolivarian Republic of Venezuela, Chile, Colombia and Peru.
[c] Bolivia, Ecuador, Paraguay and Uruguay
[d] Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama.
[e] Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Saint Lucia, Suriname and Trinidad and Tobago.
[f] Weighted average of agricultural GDP.
[g] Weighted average of agricultural and agro-industrial exports, respectively.

Given the sector's importance, it is important to form a picture of trends in the productivity of the main factors it employs: land and labour (ECLAC, 2007e).[25] The productivity of both factors has risen, for a number of reasons. In 1980-1995 irrigation use expanded at a rate very similar to that of land productivity, while from 1995 to 2003 rising land yields were associated with rapidly increasing use of fertilizers. In turn, the fact that output per agricultural worker rose more quickly than land productivity in the period 1980-2000 is due to the mechanization of production processes and investment in fixed assets.[26]

[25] A useful theoretical framework for analysing the directions of technical progress in agriculture is the model developed by Hayami and Ruttan (1970) and Ruttan (2002). According to this model, economies tend to develop and adapt the technology that saves their most scarce factor and makes it more productive. Thus, countries with little land per agricultural employee tend to encourage the use of fertilizers and irrigation techniques to increase yields per hectare, whereas countries in the opposite situation tend to encourage the mechanization of agriculture, reducing employment and increasing output per worker.

[26] Although numbers of tractors and harvesters are used as a proximate variable for the stock of physical capital, these assets represent only a partial measurement of capital stock and do not take into account some of the features of these machines, which have evolved

These trends may be used as a basis to develop a number of stylized facts that capture the sector's patterns in the region at a more disaggregated level.

With regard to land productivity, the following observations may be made: (i) more land-scarce countries report higher productivity, but have not been able to close the gap with the developed countries, which are also relatively land-scarce; (ii) countries with large endowments of land also have a larger productivity gap (lag) with respect to the United States;[27] (iii) the gap is smaller for products whose exports climbed strongly (soybean in Argentina, Brazil, Bolivia and Paraguay; sugar cane in Brazil and Guatemala; pineapple, melons, flowers, foliage, tubers and mangos in Costa Rica; bananas, coffee and sugar cane in El Salvador, Guatemala, Honduras, Nicaragua and Panama) (Rodrígues and Torres, 2003); (iv) the difference in productivity between producers of the same product widened gradually, which is evidence of an increasingly uneven capacity to absorb and propagate technological change.[28]

In relation to labour productivity, it is observed that: (i) the Latin American and Caribbean countries' labour productivity gap vis-à-vis the United States has increased, regardless of land endowment; (ii) labour productivity is higher in the countries that have a larger land endowment (Argentina has a large endowment of land and the highest level of output per worker); (iii) countries that are relatively land-scarce have widened their gap with Japan, which has the highest labour productivity of the group of countries with the world's smallest land endowments; (iv) the volume of labour devoted to agriculture has decreased in the region with respect to the industrial and services sector (this trend has occurred in a context of high urban employment and a large increase in informal employment); and (v) non-agricultural labour productivity triples agricultural labour productivity in the region. This trait is all the more striking when we consider that agriculture generates the lowest average income of all the production sectors and the labour it attracts is characterized by low human capital and extreme age groups (Köbrich and Dirven, 2007).

Briefly, then, the first thing to note is that agricultural productivity has made headway in relation to both land and labour, with more intensive use of irrigation and fertilizers and mechanization. However, these advances fall short of closing the gap with regard to the developed countries. Lastly, although the region has some cutting-edge producers, those that lack the financial conditions or the scale to adopt new technologies are by far the most common.

(b) The agrifood complex

The trends mentioned in the previous section showed that the technological potential of crop and livestock farming should not be underestimated. Technological developments in the agrifood complex shows that it is increasingly important to incorporate new technologies, including those associated with new technological paradigms (see table V.11). Technology that is "imported" from other sectors has to be adapted to the agrifood complex and, in some cases, upgraded. Owing to the significance in output of natural resources (whose access, quality, and edaphalogical and climatic specifications, among others, vary enormously from one country to another and even from one region to another within the same country),[29] major efforts are required to adopt or spread technology. The huge leaps in the productivity of certain crops, such as soybean and maize, seen in

rapidly in the last few decades, especially in terms of power, multifunctionality and precision. In livestock farming, for example, some types of animals are treated as capital flow and others, such as breeding stock and milk cattle, as accumulated capital. In addition, the statistics in most of the Latin American and Caribbean countries are not comparable, complete or regular enough to adequately illustrate the evolution of capital stock.

27 Chile is an exception, since the country's land productivity exceeded that of the United States in 2000, when comparison with the other countries ranged from 60% in Bolivarian Republic of Venezuela and Mexico to 6% in Bolivia.

28 This divergence appears to be caused by: (i) technological bias towards more productive units; (ii) lower and more erratic rainfall, which would explain the marked differences in productivity between dry farming and activities with access to irrigation; and (iii) a large number of operations isolated from the process of technological dissemination, in combination with the lack of endogenous capacities to adopt new technology (Wood, You and Zhang, 2004).

29 The variability of conditions is not limited to physical aspects, but encompasses social factors as well. For example, technology is not accepted equally in different institutional frameworks of land ownership, culture, incentives and so on.

the last few years are a function of very advanced technological packages combined with local initiatives (World Bank, 2007). Like in industry, processes of learning through practice, interaction and usage are essential. When technological capacities or complementary conditions (information, infrastructure, human capital, credit), or both, are lacking, those processes are weakened and technical change is slowed (Dirven, 2007; Cap and González, 2004; Wood, You and Zhang, 2004).

Table V.11
MAIN TRENDS IN AGRIFOOD INNOVATION

Segments of the agrifood sector	Historical trends	Recent trends
Inputs and machinery	Mechanical innovations in animal traction Mechanical innovations with internal combustion engines Mineral and synthetic fertilizers Chemical pesticides Hybrid seeds	Machinery run on biofuels Biopesticides and pest control Transgenic seeds (herbicide-tolerant, insect-resistant, with modified contents) Biofertilizers Combined packages of herbicides/insecticides Direct sowing and self-propelled sprayers
Agricultural production	Successive mechanization of the different phases of production Confined animal rearing with industrially processed feeding Artificial insemination and selective reproduction Irrigation	Use of global positioning system (GPS) and geographical information systems (GIS) Hydroponics Transgenic production Vitamins, amino acids, hormones and vaccines for animals In vitro fertilization, cloning, embryo transfer Fertirrigation Direct sowing and other process technologies Double cropping and intersowing
Ingredients and first stages of processing	Mass factory production, standardization Separation of ingredients Preservatives and chemical additives	Fractioning, generic food ingredients Chemical ingredients that mimic the traits of fresh food Controlled fermentation Long-life products
Final processing (food manufacturing)	Food conservation by tinning, refrigeration and dehydration Fast freezing Substitution of ingredients for cost and convenience (animals for vegetables, natural for chemical, and so on)	Conservation by radiation or biopreservatives Prepared foods Consumption outside the home Greater possibilities of ingredient substitution and food reconstitution Fresh, natural low-fat, low-calorie and diet foods Nutraceuticals
Packaging and distribution	Tins, glass, long-life packaging Refrigerated and frozen transport and marketing	Recyclable and biodegradable packaging with controlled temperature and air flow Year-round availability of fresh foods Multimodal refrigerated transport Information based on barcodes
Marketing	Objective/educational advertising, showing the product's features and how to consume it	Subjective advertising aiming to act upon consumer perception Interactive publicity
Generic technologies	Mechanization and technology transfer from chemical industry	Informatization, biotechnology, robotics and telecommunications

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of C. Wagner Weick, "Agribusiness technology in 2010: directions and challenges", *Technology in Society*, No. 23, 2001; J. Wilkinson, "The R&D priorities of leading food firms and long-term innovation in the agrofood system", *International Journal of Technology Management*, vol. 16, No. 7, 1998; M.D. Earle, "Innovation in the food industry", *Trends in Food Science and Technology*, vol. 8, May 1997; and D. Goodman, B. Sorj and J. Wilkinson , *Da lavoura às biotecnologias*, Rio de Janeiro, Campus, 1990.

The agrifood complex is a sector with a huge requirement for technology and can thus stimulate learning in other sectors. This idea is far from being new in the region. Already in the import substitution period (especially in Brazil and Argentina), the requirements for chemicals and metallurgy for agricultural production were powerful drivers of industrialization. Naturally, capacity-building possibilities now have to be considered in the new context of open economies and shifts in technological paradigms. Nevertheless, one major difference gives grounds for cautious optimism: the countries were late in adopting the so-called agricultural revolution and adapting it to local conditions, whereas, to a greater or lesser extent, the new models of agricultural production —driven by a biomanagement rationale— have arrived relatively early in the Latin American and Caribbean region.

Another factor to bear in mind is that the agrifood complex is tending strongly towards greater technological sophistication in the goods it produces, as a result of product differentiation and key consumer issues such as food origin and safety, as well as the indispensable incorporation of services for marketing: logistics, packaging, transport and distribution in general, including the improvement of customs offices and port logistics for exports (Wilkinson, 2001). These represent downstream opportunities to integrate new products and activities that are related to the agrifood production chain but little explored in the region. There are also major upstream opportunities to develop inputs for agriculture (machinery, seeds, agro-chemicals, technical assistance services), through interaction with state-of-the-art technology industries). It should be observed that moving towards goods with greater value added does not necessarily imply more degrees of industrial processing, but it does require a higher knowledge and innovation content, not only as regards raw materials of agricultural origin, but also in the other stages of the agrifood complex (including, again, logistics and marketing).

The technological potential of the agrifood complex has been substantially altered by the impact of the new technological paradigms, especially biotechnology and, as a complement to this, ICTs, particularly with respect to some of the advances in informatics for production and the use of georeferenced information systems. There are a variety of applications for the new paradigms, which are examined in the next section. They include (see World Bank, 2007 and table V.11) the growing of virus-free tissues, genetically modified seeds, molecular diagnosis of plant and animal diseases, embryo transfer in livestock, the use of genomes to identify and transfer genes that carry desirable traits (for example, resistance to pests and disease and to hydric and temperature stress, with higher or lower content of particular substances, and so forth). Some of these applications, especially those relative to genetically modified organisms (GMOs), have aroused controversy and there has been resistance to their use in certain countries. Nevertheless, broadly speaking they have had very significant effects on productivity levels and profitability, especially in some countries, and they represent a rapidly expanding frontier in agricultural innovation.

2. Spread of biotechnology in the agrifood complex

(a) Main characteristics

As discussed in chapter III on innovation, the generic and cross-cutting nature of biotechnology led multinational firms to develop strategies of diversification (GEST, 1986). As biotech capacities developed, those firms were able to enhance the value of their advantages in several areas of application, including the production of genetically modified medicines, foods and seeds. Corporations have applied biotechnology to a broad range of products, from medicines to agricultural inputs, and have thus been able to increase the differentiation of final products. As well as by forming strategic alliances (mostly highly asymmetrical and coordinated by multinational corporations), biotechnology is spread by processes of mergers and acquisitions, aiming for economies of scale and control of complementary production and technology assets. At the same time, the different agents develop commercial and strategic networks to help secure patents.

Generally speaking, these are large existing firms which have shifted their production strategy to focus on biotech progress and complement their prior activities. There are few cases of start-ups encompassing everything from the scientific breakthrough to the final consumer or user.

In keeping with these trends, activity revolves around a small group of large firms that pursue an active policy of mergers, acquisitions and strategic alliances, both with other private companies and with public universities or laboratories. The economic and technical scales involved, the risks inherent in development activities and the complexity of the subject matter lead to the establishment of international networks, which offer multiple opportunities and increase the challenges involved in developing pre-existing technical and production capacities.

This is the framework in which biotech progress has occurred in the region. The first applications in agricultural production date from the 1980s and are associated with plant micropropagation techniques (which are fairly low-tech and readily accessible for developing-country SMEs). The greatest advances stem from the possibilities opened up by genetic engineering and genomics in identifying and developing new traits in inputs and products. The main trends in biotechnology as applied to the agricultural sector are set out in table V.12, which summarizes advances in technology, as well as the main products affected and the type of firm active in the sector.

Table V.12
DEVELOPMENTS IN AGRO-BIOTECHNOLOGY

Biotechnology techniques	**Crops**	**Main agents and forms of governance**	**Real effects, possible progress**
Plant micropropagation	Ornamental plants, fruit, tobacco, forestry and other crops	SMEs, public research bodies, public-private alliances	Ensures quality and consistency of raw materials Improves plant health
Molecular markers	As above and main agricultural crops (maize, soybean, cotton, canola, alfalfa)	Public research bodies, traditional seed producers, multinational agro-biotech firms, cooperation agreements and vertical integration	As above Simplifies and shortens the timescale of traditional plant breeding Directs selection processes more precisely
Genetic engineering	Maize, soybean, cotton, canola, alfalfa, others	Large multinational agro-biotech firms, dedicated biotech firms, traditional market for scientific and technological knowledge (licences and alliances) and integrated models	Increases efficiency, reduces costs and simplifies production processes Consolidates new technology packages (genetically modified organisms, direct sowing, multi-resistant: herbicides, insects, plant diseases) Reduces process time and enables double cropping Pushes back the technology boundary and displaces non-modified crops Enables progress in input characteristics: hydric stress, salinity Enables cultivation of genetically modified crops to suit subsequent applications (second- and third-generation biotechnologies)
Genomics, proteomics, metabolomics	As above and tropical crops	Large multinational science-based firms, dedicated biotech firms and public research bodies, university networks and secondary market for scientific and technological knowledge	Identifies new genes with new input traits and products Identifies possible relations between DNA and functions of living organisms

Source: G. Gutman and P. Lavarello, "Moderna biotecnología en América Latina: oportunidades en los sistemas agroalimentarios", Santiago, Chile, Economic Commission for Latin America and the Caribbean (ECLAC), 2007, unpublished; R. Bisang, M. Campi and V. Cesa, "Biotecnología y desarrollo", Santiago, Chile, 2007, unpublished.

In the 1980s, opportunities for new progress in genetically modified crops were derived from scientific progress in molecular biology. Like in the field of pharma-biotechnology, an organizational model developed from the convergence of large agro-chemical corporations —seeking to consolidate the market for their own mature products— and dedicated biotech firms. Developments in biotechnology, agro-chemicals and traditional plant breeding techniques converged, generating major synergies between health and agriculture applications. When R&D spending lost productivity in the pharmaceutical and agro-chemical industries, some of the multinational corporations in those sectors redoubled their efforts to create transgenic seeds that were resistant to herbicides, insects and disease.

Since the mid-1990s, biotech activities have focused on finding complementarities between agro-chemicals and seeds, thus developing agronomic packages that help to realize strategies of "appropriating" innovation and applying it in agriculture. As own brand herbicide- and insect-resistant seeds were launched, these were accompanied by a broad range of services for the farmer. In this way, firms began to develop full technology packages (from transgenic seeds to herbicides, including process technologies), which could be adapted to particular soil and climate conditions.

This strategic shift changed the structure of the large firms, splitting agro-biotech from pharmaceutical departments. At the same time, there was an increase in mergers and acquisitions with seed companies and other types of firms at the downstream end of the agricultural business. In some cases, this caused splits in business structures, like the spin-off of the seed divisions of Novartis and Zeneca to form Syngenta in 1999. Thus, an industrial organization sprang up in which large agro-chemical multinationals grew out of pharma-biotech groups and formed the cores of new networks of alliances and acquisitions among biotech and seed firms.[30]

The new paradigm of transgenic seeds was another step in the same direction, but with new economic agents also from non-agriculture disciplines (molecular biology, chemistry and even informatics) (see table V.13). In the new scheme, control lies essentially with knowledge of genetics, in combination with the financial accords necessary to support quantitative leaps. At least three things are necessary to develop a transgenic seed: (i) to have the best existing varieties (the fruit of previous work by plant breeders); (ii) to determine and isolate the gene that contains the desired "instruction" (using basic and applied research usually conducted in public institutions or dedicated firms); and (iii) to have the technology to successfully incorporate the gene or genes in a controlled manner into the existing variety. This requires access to seed varieties, hence either agreements with plant breeders or acquisitions. Multinational corporations tend to base their strategies on mergers, alliances and acquisitions, so that they can repeat the process of isolating the gene and incorporating it into a variety with other crops. In the last few years, the sale of seeds with more than one modification has begun to be deregulated (for example, seeds that are resistant to both insects and herbicides).[31]

The main advances in genetically modified seeds today refer to the application of particular herbicides or insecticides and to growing techniques that require new tacit knowledge. The large multinational corporations are developing strategies to encourage producers to use full technology packages with their respective brand names. Often, the channels for marketing these increasingly sophisticated packages even offer financing (see box V.4). Here again, control of complementary

[30] The United States is an illustrative case in this respect: the number of specialized biotech firms dropped from 16 in mid-1985 to only 6 in 2000, while the number of seed companies dropped from 10 to 2. In both cases, firms were absorbed by multinational agro-biotech and agro-chemical corporations. The acquisition of dedicated biotech firms gave multinational agro-biotech corporations full access to patents held by the dedicated firms (Schimmelpfennig and King, 2004). In this way, multinational corporations were able to complement their previously developed competences in chemical synthesis and plant and animal growth regulators with scientific knowledge of genetic and technological plant transformation, which was the seed companies' field of competence. In the process, they also gained know-how generated by the dedicated agro-biotech firms in the fields of nutrition, grain protection and biological control.

[31] The first major advances were made in the early 1980s by three universities and one firm: Washington University-St. Louis (United States), University of Wisconsin-Madison (United States), Rijksuniversiteit-Gantes (Belgium) and Monsant-St. Louis (United States). The first transgenic products began to be sold a few years later, but the momentum continued well into the 1990s, when glyphosphate-tolerant soybean and insect-resistant maize began to be distributed (Bisang, Campi and Cesa, 2007).

assets is crucial in order to capture the rents generated by the new technology (Bisang, Campi and Cesa 2007; Bisang and Gutman, 2005).

Table V.13
COMPOSITION OF SALES IN SELECTED FIRMS, 2006
(Millions of dollars and percentages)

Firm	Agro-chemicals		Seeds		Total (seeds and agro-chemicals)	Main products (seeds)
	Sales	Percentage	Sales	Percentage		
Syngenta	8 036	79	2 196	21	10 232	Maize, soybean, beets
Monsanto	4 028	55	3 316	45	7 344	Soybean, maize
Bayer CropScience	5 851	93	431	7	6 282	Cotton, canola, rice, vegetables
Dupont	2 163	44	2 764	56	4 927	Maize, soybean
Basf	3 911	100	0	0	3 911	
Dow Agrosciences	n.d.	n.d.	n.d.	n.d.	n.d.	Maize, soybean, cotton, rice

Source: R. Bisang, M. Campi and V. Cesa, “Biotecnología y desarrollo”, 2007, unpublished.

Note: An average annual exchange rate of US$ 1 = 1.26 euros was used to express sales in dollars.

Box V.4
TRANSGENIC CROPS IN LATIN AMERICA

The emblematic case is transgenic soybean (Gutman and Lavarello, 2006; Bisang and others, 2006). Argentina and Brazil —and, to a lesser extent, Uruguay, Paraguay and Bolivia— are the region’s major producers, accounting for just over 50% of soybean exports and of markets for soy meal for animal feed and soybean oil. In Argentina, over 95% of the land area under soybean is sown with transgenic varieties, and the situation is similar in Bolivia, Paraguay and Uruguay. Obviously this lowers production costs (by an estimated 20% to 25%). The last few years have seen the consolidation of a “technology package”, consisting of transgenic soybean, the biocides adapted to the new seeds (provided by the multinational corporations that supply the seeds), fertilizers, new agricultural machinery and direct sowing, as well as a clever system to protect intellectual property, which has enabled a considerable reduction in production costs, thus increasing the country’s comparative advantages. The earlier spread of direct sowing techniques helps to explain the speed at which the new technology package is being adopted. The new package, which has spread and been adapted in Argentina, is the result of converging technology paths in the agricultural machinery and complementary agro-chemical industries, national research institutes and private producers’ organizations. This has been complemented by the consolidation of the soy milling industry, which had already expanded strongly since the 1980s, driven by the multinational corporations in the sector, large dealers in the international grains market and large financial groups in Argentina.

In Argentina (and, to a lesser extent, in Uruguay, Bolivia and Paraguay), the process of technological change has been accompanied by organizational innovations, especially in the large agricultural concerns that have emerged in the last few years in soybean and in other grains such as wheat and maize. The new forms of organization of agricultural production reflect a number of factors: (i) the technical services offered by the large multinational corporations in the areas of agro-chemicals and genetically modified seeds as part of the new technology package have led to greater outsourcing of operations and activities in agriculture (sowing, harvesting, fertilization, services); (ii) the particular configuration of capital invested in Argentine agriculture in the last few years, with major stakes being held by investment funds and other types of investors, whose management strategy is based on renting land and outsourcing services; and (iii) the restructuring of the “agricultural machinery contractors” sector, which emerged in the pampa during times of excessive use of machinery and has now been reconverted with the new machinery associated with the boom in soybean and direct sowing. Thus a broad network of subcontractors and contractual relations has developed, covering from farming concerns to suppliers of inputs and services (Bisang and Kosacoff, 2006). In the case of Brazil, too, although the primary production model is heavily based on large integrated farms (with less subcontracting), strong technical support is provided by suppliers of inputs and, with few exceptions, the milling industry is highly concentrated and owned mainly by foreign stakeholders. With these structures, over 50% of the production of grains, oils and pellets made from oleaginous seeds in the countries of the region is dominated by international concerns. These products (especially oils and flours) form a growing portion of exports and are integrated into different international processing circuits, be it for oils (refining, lecithins, and so on) or meal (feed for pigs and fowl in the case of exports to the European Union, or for intensive livestock rearing, in the case of Brazil). A number of the firms that export from the Latin American countries are in fact buyers in the developed countries, which have integrated their Latin American concerns in their production networks. Meanwhile, the global trend of taxing food imports in inverse proportion to their degree of processing (lower duties for grains, higher ones for oils and even higher ones for lecithins, refined oils, beef and poultry meat) could limit the possibilities of moving up the soybean production chain.

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

With progress in sequencing and identifying new genes, in combination with the development of new disciplines in the study of how genes relate to different functions of living beings, modern biotechnology has become even more multidisciplinary, recombinant and accumulative. These advances enable the modification of species to improve the quality of food (meats, milk) or industrialize raw materials (leathers, fats, hair, and so on). Biotechnology can be used to pinpoint exactly which genes are responsible for particular traits, whether desirable or not, and —by extracting living material, i.e., blood, hair or epithelial cells, among others— to carry out tests that confirm or rule out the presence of that set of genes. This replaces mechanisms of subjective quality identification (pedigrees) or methods that depend on ex post performance evaluations with objective criteria that are obtained directly. At the same time, it is easier and quicker to classify the quality of the raw material entering industry, which opens the door to differentiation of final product and prices.

What is much more complex is to alter animals' genetic profile by introducing genes that change the configuration or quality of an output (like milk). There is potential for progress in multiple areas, but concrete achievements are limited to a small number of cases. The most important has been the production of transgenic animals which produce milk containing certain modifications. These are the first steps towards what are known as "nutraceuticals", which would have genetic alterations aimed at endowing milk with a series of elements that used to come from added nutrients or medicines. The idea is to have animals produce naturally (via modified genetic instructions) elements that for decades have been synthesized pharmacologically. Table V.14 summarizes the progress in biotechnology in animal genetics and gives some examples of applications (Bisang, Campi and Cesa, 2007).

In the food industries, the increase in the award of patents to large multinational corporations includes technologies directly linked to the preparation of foods and to some non-core technologies, as is evident from the patents awarded in the fields of chemistry, biotechnology and drugs (Alfranca, Rama and von Tunzelmann, 2004). There are barriers to the entry of dedicated firms into the industries in which food biotechnology is applied. Research by Valentin and Jensen (2003) showed that only 3% of patents related to lactic acid bacteria correspond to dedicated firms, while over 37% correspond to three large multinational food and ingredients corporations (Unilever, Nestlé and Chr. Hansen). Public research organizations (technology institutes and universities) play a prominent role in patenting new food biotechnologies, representing 23% of patents. Although the large multinational agrifood corporations form alliances with technology institutes and universities to work in different fields of innovation (especially in the initial phase of identifying technology opportunities), they continue to spend large amounts on internal R&D.

Lastly, biotechnology has also had strong repercussions in the agrifood ingredients industry, which has largely grown out of diversification strategies in the chemical industries. Like in the other cases, the initial technological knowledge base came from the pharmacological and agrifood industries. These industries display an ongoing process of mergers and acquisitions among firms, in which it is possible to distinguish three convergent trajectories:

- Pharmaceutical or chemical groups that have started producing ingredients to add value to their scientific and technological competences (Basf, Degussa, DSM, Genencor and Novozymes, Givaudan, IFF and Rodhia);
- Large stakeholders in the grains business, which have invested in biotechnology and are in a position to experiment with the development of raw materials with higher value added using the commodities that they produce and market (ADM and Cargill); and
- A number of food firms that have shifted from their traditional consumer goods markets, which have gradually become saturated, to intermediate products for the agrifood, pharmaceutical and textiles industry (Ajinomoto, Chr., Hansen, Kerry, Danisco and ABF).

Table V.14
BIOTECHNOLOGY APPLICATIONS TO ANIMAL GENETICS

Technique	Cases	Effects
Total/partial identification of the genetic map (or of specific genes)	- Tenderness genes in cattle - Genes for proteins, lipids and others in milk - Manifestation of genes for marbling in meat - Genes for thickness and quality of wool in sheep - Map of genes that identify an individual as unique - Identification of the set of genes that determines a phenotype	Tenderness can be determined objectively (by the origin of the cattle) Quality of milk output can be determined objectively As for first item Better quality of raw material Enables inviolable systems to identify and determine origin Optimizes natural process of crossing; makes race quality objective (changes subjectivity for objective parameters of primary raw material productivity)
Cloning	- Animals for experiments - Transgenic animals for modified milk - Transgenic animals for organ transplants with minimum rejection - Animals facing extinction	Cost and quality gains in research New products
Transgenic modifications (sum of interspecies genes)	- Genes that produce abundant organic defences - Colouring genes - Genes that improve transformation processes for food/meat/fats/milk - Genes that modify rumination process (lower ethanol emissions) - Genes that improve resistance to climatic conditions	New products Lower costs Environmental improvements
Related techniques	- Artificial insemination - In vitro fertilization - Sexing of embryos - Sexing of semen - Proof of evaluation - Determination of pre-determined qualities of race patterns	Gains in herd quality and better industrial raw material Better selection process Cost and output gains Gains in costs of producing meat and milk by selection
Description of genome maps	Base technology that improves all the techniques mentioned above	New products and processes

Source: R. Bisang, M. Campi and V. Cesa, “Biotecnología y desarrollo”, 2007, unpublished.

Following their marked technological shift, the food ingredients firms have become greater innovators than their clients in the food industry. As may be seen in table V.15, the agrifood ingredients firms are engaging in more intensive R&D activities than the food industry multinationals. In fact, although the latter firms spend more in absolute terms, as a percentage of sales, the ingredients firms have an R&D budget two to five times that of the large food corporations. Ingredients producers are therefore playing a key role in driving technology in the agrifood industries. Just as agriculture relies on a small number of external suppliers for biotechnologies, the food industry turns to specialized suppliers of agrifood ingredients. In both cases, the complexity involved and the particular demand-side requirements lead to close relations between suppliers and users.

Table V.15
MAIN MULTINATIONAL FIRMS IN AGRIFOOD SYSTEMS, 2006

Industry	Firm (and main technological field)	Sales (millions of dollars)	R&D investment, percentage of sales (1)	Investment in fixed assets, percentage of sales (2)	Complementary assets indicator (*) (2/1)
Agro-chemicals/ seeds	Syngenta (pharmaceuticals)	8 582	10.1	2.2	0.2
	Monsanto (chemicals)	6 665	9.3	4.5	0.5
Food ingredients	Novozymes (pharmaceuticals)	1 053	12.6	5.7	0.5
	Chr. Hansen (foods)	735	10.1	8.1	0.8
	Danisco (foods)	3 502	4.5	5.2	1.2
	DSM (chemicals)	10 238	3.5	4.7	1.3
	Ajinomoto (foods)	9 627	2.7	4.9	1.8
Food industries (users)	Nestle	73 185	1.6	3.8	2.4
	Unilever	49 560	2.4	2.4	1.0
	Danone	16 544	0.9	4.6	5.1
	Cadbury Schweppes	13 013	0.8	4.1	5.1
	General Mills	12 327	1.5	3.1	2.1
	Kellogg	10 778	1.8	3.7	2.1

Source: G. Gutman and P. Lavarello, “Moderna biotecnología en América Latina: oportunidades en los sistemas agroalimentarios”, 2007, unpublished.

(*) Substitutive indicator of the importance of complementary fixed assets in biotechnological R&D progress.

In summary, then, biotechnology is reconfiguring technology trajectories in several sectors (agriculture, agrifood industry and food ingredients), affecting market structures, types of agents and competitive strategies in a number of ways. Broadly speaking, there is a marked trend towards convergence between sectors, as well as a move towards concentration and mergers among large multinational companies and dealers seeking to strengthen their competitive position by dominating a combination of complementary assets. Although the cores of those innovation processes are located in these firms and in developed countries, the strengthening of local technological capacities is crucial to the speed at which these processes spread, their effects on productivity and, as will be discussed later on, the role of local public and private firms.

3. Public institutions and local private agents

The foregoing analysis has shown that, although profound institutional and organizational changes have taken place in the region to promote the dissemination of technology packages, local capacity to develop and control biotechnology is still incipient and very uneven among countries and across activities. Nevertheless, a number of Latin American countries have the conditions and capacities to promote a more active presence for the region in biological product and process niches.

Starting in the 1950s, a number of research institutions were set up (see boxes) in the Latin American countries. These took different forms:

- national science and technology councils;
- agricultural research and development institutes;
- industrial research and development institutes; and
- institutes for research, development and production of inputs for health.

Over the years, research and production programmes carried out by these entities built up the capacities that would become —in the framework of the new paradigm— “inputs” for biotechnology. Thus, in almost all agricultural R&D institutes, plant breeding programmes formed the basis for the subsequent development of hybrids. Something similar occurred with pest control. In the case of public health institutes, the study of various endemic diseases grew into research programmes that, in some cases, led to the creation and subsequent production of vaccines. All this generated incipient inputs for later progress in biotechnology at the regional level (Vessuri, 2003; Echeverría, Trigo, Byerlee, 1996; Carbonell and Infante, 1996; PROCISUR, 2001; Bisang, Campi and Cesa, 2007).

Many of these institutions were created and planned under the rationale of the substitution model, lacking solid links between technology and production. The institutions that grew up were fragmented, with little or no concern for the systemic aspect of innovation. Their work tended to be weakened and isolated by inertia (since they were modeled on the linear paradigm of science and technology), as well as the recurring fiscal crises that placed financial constraints on their operations and the now almost legendary swings of public policy.

In the 1990s, almost all the science and technology institutions in the region undertook to set up systems (see box V.5). Biotechnology figured on the public technology agendas of all the countries, but in the context of the existing institutional structure. In the late 1990s, a piece of work specifically on the agricultural area reported 85 units in Latin America, of which 22 were public institutes, 37 were laboratories and institutes attached to universities and the rest were privately owned or cooperation agencies. The survey found that, together, they employed some 1,400 scientists and had a budget of around US$ 16 million per year. Argentina and Brazil showed the highest knowledge density. As might be expected, more progress was registered in simpler, initial processes (micropropagation, polymerase chain reaction (PCR) and so on) than in genetic engineering (Trigo and others, 2000; Cohen, Komen and Versategui, 2001; Bisang, Campi and Cesa, 2007).

Box V.5
PUBLIC INSTITUTIONS

In **Argentina**, several decades ago, a number of public institutions and programmes engaged in conducting a range of research projects in different fields of biology, which years later translated into advances in the production of medicines, vaccines and other health-related products. The activities carried out in institutes such as Malbrán, the CAMPOMAR foundation, the National Council of Scientific and Technical Research (CONICET) and other agencies attached to national universities testify to these efforts. At the same time, major strides were made in chemistry and molecular biology research applied to crop-growing, especially by the National Institute for Agricultural Technology (INTA) —a plant breeding icon— and in some of the country’s universities (Gutman, Lavarello and Roisinblit, 2006). In the 1990s, cooperation agreements began to be made with very different parties from before, increasingly (and in some cases mainly) with the private sector (Gutierrez and Penna, 2004). In the last few years, the Institute of Molecular and Cellular Biology of Rosario (IBR), which was created by the Board of CONICET, has strengthened research and teaching in biological sciences. The origins of the Institute go back to when the different divisions that comprise it today —molecular biology, microbiology and biology of development— were independent entities that began to work together.

In **Brazil**, biotech capacities are concentrated in two public enterprises, financed principally by the government. The Brazilian Agricultural Research Enterprise (EMBRAPA), which coordinates the Brazilian System of Agricultural Research (SNPA) in cooperation with universities and institutes, is the leading centre for tropical agricultural technology in the world. The other is the Oswaldo Cruz Foundation (Fiocruz), the parent of the main local spin-offs in the areas of medicines and human health (Derengowski Fonseca M. Silveira J.M. and Salles-Filho S., 2002). EMBRAPA has carried out most of the biotech R&D in the agroindustrial and foods sector. Internationally renowned, it has had its own budget of US$ 300 million per year since 1994, not including wages and infrastructure. The agency has recently built up its capacity to appropriate generated technology and protect intellectual property rights over crops, having established new internal rules limiting private partners’ shares in the ownership of jointly developed materials, and even reviewing existing collaboration agreements (Fucks, 2007). In the genome project for the bacteria *Xilella fastidiosa,* a consortium of Brazilian researchers was successfully organized to sequence the genome of a phytopathogen. The importance of this lies in the discovery’s significance for the Brazilian economy (because it refers to a disease that affects orange production) and the creation of molecular biology and bioinformatics capacities. This is a case in which development was completed entirely on an interactive model of science, technology and production based on public initiative.

Box V.5 (concluded)

In **Chile**, Innova Chile —which was formed in 2005 by the merger of the former Development and Innovation Fund (FDI) and the National Fund for Technological and Productive Development (FONTEC)— promotes innovation initiated by the private sector and proactively, in key sectors of the economy (agroindustry, aquaculture, forestry and mining). The biotechnology programme aims to promote innovative new firms and technological innovation projects in existing enterprises, with an emphasis on natural-resource-based sectors. Innova Chile promotes two major partnership-based initiatives: renewable natural resources genome programmes and business technology consortiums. The biotech projects it supports include: (i) the salmon technology programme; (ii) the natural resources genome programme, jointly with the National Commission for Scientific and Technological Research (CONICYT), whose projects include nectarine gene sequencing for resistance to cold during transport; and (iii) the convening of business technology consortiums, jointly with the Foundation for Agricultural Innovation (FIA) and CONICYT. Other important institutions are FIA, mentioned above, which supports biotech projects in forestry, crop and livestock farming and aquaculture; the CONICYT Fund for Priority Areas (FONDAP), which promotes investment in infrastructure and in human resources for R&D in strategic areas; Innova Bio Bio for innovative advances in the Bio Bio region, in priority areas of forestry, crop and livestock farming and aquaculture; the Scientific and Technological Development Fund (FONDEF) and the Technical Cooperation Service (SERCOTEC), which promotes investment in SMEs.

In **Colombia** the National Biotechnology Programme has concentrated on financing research projects for agriculture. Of the 174 projects financed through the Colombian Fund for Scientific Research and Special Projects (COLCIENCIAS), 99 (or 57%) correspond to the agricultural sector. In 1993 Colombia had 30 research units in the sector, but by 1999 this number had risen to 42 (Orozco and Olaya, 2004) and by 2003 to 45 (OAS, 2004). The most prominent research body in the country is the Colombian Corporation of Agricultural Research (CORPOICA). Local biotech capacity consists mainly of techniques for growing tissues and cells, plant micropropagation and the use of molecular markers. There are difficulties, however, with the shift to modern biotechnology, since Colombia is not making full use of its considerable biological diversity advantages (Orozco, 2006). Although several laboratories are using molecular biotechnologies and have been able to locate genetic sequences associated with agriculturally important traits, there is no scientific or technological capacity to evaluate the functionality of the genes identified or develop applications to manage and control limiting factors in agriculture.

In **Cuba** biotechnology is central to development strategy and, as such, is coordinated exclusively by the State, both on the research side and in development and production. Together with Argentina and Brazil, Cuba may have made the most progress in biotechnology in the region. Unlike those two countries, however, the Cuban model is based on a strong public-sector commitment to foundational research within a scheme clearly oriented towards the fields of human health and specific agricultural activities (Borroto, 2006). Cuba currently has 15 scientific "poles", 12 geographical and three sectoral: the Western Havana Scientific Pole develops biotechnology for use in health care, pharmacy and agroindustry in general, with 52 institutions and over 4,000 scientists and engineers. The scientific, technological and production activities carried out there have led to major strides in intellectual property generation and management, with 158 objects invented and over 300 patents, many of them registered in developed countries. Cuba has also obtained and commercialized important bio-pharmaceutical products and medical equipment of renown in the country's health system. The main institutions in the pole undertake over 100 R&D projects, and much of their strategic research is aimed at the production of therapeutic vaccines and new adjuvants, proteomic studies, population genetics, bioinformatics, cognitive neurosciences, the strengthening of technological platforms and the development of new formulations for bio-pharmaceutical products, generic medicines and natural products. The system has 15 biofactories which operate as germplasm banks and produce disease-free propagation material, generating 60 million plants and synthetic seeds per year. Finlay S.A., a public enterprise, is a spin-off resulting from the industrial upgrading of these scientific advances, and its sole purpose is to provide a commercial outlet to the external market for these undertakings.

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of information from the respective countries.

To complete the general picture, each of the countries had a large number of small research groups looking at specific themes and a broad range of programmes in a wide variety of institutions. Thus, the well-known problem of funding shortages for R&D was compounded by the difficulties involved in coordinating substantive and more specific programmes within the public sector. Very few initiatives have been coordinated between countries, even in fields with shared problems and challenges. This opens up an additional space for public policies to coordinate and concentrate R&D efforts.

Briefly then, the substitutive industrialization experience led to the creation of a set of capacities and agencies that would later become inputs for the new paradigm. Because of the way these agencies were designed and the severe institutional and financial instability they often suffered, they did not fully achieve the objective of promoting innovation and spreading technology. However, they did form a capacity base and gain experience of innovation that could serve to generate progress in the future and they were important points of reference for public policies (Bisang, Campi and Cesa, 2007).

Production and research activity is not confined to public agents. As noted earlier, the first advances by biotech firms in the region appeared in the mid-1980s. Table V.16 summarizes some relative successes by innovative Latin American firms. A first observation with respect to these is that they are concentrated in the fields of human and animal health (aquaculture in the case of Chile). This suggests, at least at first sight, that some potential areas of local biotech development are different from those in which large multinational corporations operate today (genetically modified seeds). In these cases, the stock of basic science capacities and prior trajectories were fundamental for incursion into new technologies. Technology alliances, often with transnational firms and in all cases with local technology institutes and universities, have also been very important.[32]

Local firms cover a wide range of activities, including recombinant vaccines (as spin-offs of achievements in public and private initiatives undertaken in public health institutes), inoculants, plant micropropagation, genetic insulin and milk enzymes and cultures. Local firms show less involvement in more advanced initiatives, but have worked on the sequencing of certain genes (only some projects by EMBRAPA, INTA and some chemical engineering faculties in Argentina), animal cloning (only Biosidus in Argentina) and attempts at comprehensive development (genes plus varieties) by firms linked with national science and technology systems (Bioceres project in Argentina, BioChile in Chile).

The largest local dedicated biotech firms invoice at most US$ 40 million per year. Biosidus of Argentina (medicines), Vallée and Biobrás of Brazil (medicines), Biogénesis-Bagó (animal vaccines in Argentina) and Finlay (Cuba) are the largest. These firms report a rate of R&D with respect to sales much higher (by around 10% or more) than other firms in the countries' respective manufacturing sectors. They are also among the most innovative local firms —in both products and processes— and have highly skilled human resources. However, their size and degree of biotech specialization are undoubtedly in a smaller league than global leaders such as AMGEN of the United States, which invoices some US$ 11 billion annually. Being smaller firms, similar innovative efforts —in percentages of sales— represent lower amounts of investment in an international comparison (Bisang, Campi and Cesa, 2007; Gutman and Lavarello, 2007).

Local firms have other features in common, too. The prevailing forms of business organization show only weak mechanisms of cooperation or subcontracting among private firms. Although they form relations with public research groups, there is no institutional scheme within which these organizations could develop and appropriate the quasi-rents accruing from innovation. The development of dedicated biotech firms and public institutions is thus deficient in this sense, unlike what occurs in developed economies. This means that firms sometimes have to complement the biotech projects in their investment portfolios with other similar projects (medicines, conventional seeds, plants) in order to make them viable.

[32] One aspect to bear in mind is the possibility that innovative firms will be absorbed by foreign enterprises, which can, in some cases, weaken local learning processes. The longer the gap between the development and the possibility of starting to do business (especially at the international level), the smaller the chances of survival for local firms, since, relatively speaking, they face higher regulatory and financial barriers and risks in the international context.

Table V.16
INNOVATIVE LATIN AMERICAN BIOTECH FIRMS, SELECTED CASES

Country/firm	Field of application, strategies	Main products and advances
Grupo Sidus	Global cooperation agreements. Technology alliances with institutes and universities	
Biosidus (1983)	Human health. Aims to become one of the world's largest suppliers of insulin	Recombinant proteins for therapeutic use (erythropoietin, interferon). "Pharmaceutical milk farm": (i) human growth hormone, from cloned transgenic cows (2002); (ii) production of human insulin from cow's milk (2007), awaiting commercial approval
Tecnoplant (1992)	Agriculture	Plants cloned in vitro. Blueberry, raspberry and other berry plants. Resistance to virus and herbicides, species genotypification
Biogénesis-Bagó (the two firms merged in 2006)	Veterinary products for large animals. First producer and exporter targeting MERCOSUR, investments in Brazil. R&D agreements with public institutes (Centro Venezolano Americano de Mérida-CEVAM; Chilean Nutrition and Food Technology Institute - INTA) and universities	Vaccines for foot-and-mouth disease. Recombinant viral and bacterial vaccines. Diagnostics for bovine diseases. Exports fish technology to Chile
Biobrás/Novo Nordik	Human health. Absorbed technological capacities through alliance with Ely Lillie, acquired in 2002 by the Danish multinational Novo Nordik	Fourth largest producers of recombinant insulin in the world
Biomm	Human health. Fully dedicated biotech firm, spin-off from Biobrás, listed on São Paulo Stock Exchange	Owner of Biobrás recombinant insulin technology, production platform for recombinant proteins
FK Biotecnología	Human health. Spin-off from a university initiative	Develops monoclonal antibodies, vaccines, antibody detection, cancer vaccines
BioManguinos	Human health. Biotech enterprise of FIOCRUZ Institute	Advances against yellow fever and chagas disease
Vallée	Animal health. Took advantage of foot-and-mouth disease incentives. Alliances with various universities and institutes (EMBRAPA, Biobrás, Cuban laboratories)	Produces foot-and-mouth vaccines. Develops vaccines for brucellosis. Control of clostridium and horn fly. Pre-test for porcine somatrophine, micro-encapsulation, bovine genomics, vaccine for bovine mastitis
Bio Innovation	Aquaculture. Broad alliances with national and foreign firms, competitive funds, universities and national laboratories	Oral DNA vaccines for fish
Bios-Chile (1986)	Largest pharmaceutical firm in Chile, devoted to R&D, production and commercialization of products for human and animal health arising from modern biotechnology. Strategy includes alliances with public institutions, global leader firms and universities, supplier/client relations, niche market development	Vaccines, diagnostic trials and reactants, monoclonal and polyclonal antibodies, human growth hormones
Vecol	Animal health. Mixed enterprise (80% State). Integrated into international university networks	Biological vaccines
Orius	Agriculture. Medium-sized firm integrated and allied with local associations and institutes (CORPIOCA, National Coffee Research Centre (CENICAFE) of Colombia)	Various inoculants based on extractive methods

Source: G. Gutman and P. Lavarello, "Moderna biotecnología en América Latina: oportunidades en los sistemas agroalimentarios", 2007, unpublished and R. Bisang, M. Campi and V. Cesa, "Biotecnología y desarrollo", 2007, unpublished.

So, interesting and relatively successful cases of biotech innovation are not confined to public institutions, but are also found in a number of local enterprises, especially in the fields of animal and human health. In these cases, however, alliances with public institutions in the science and technology sector are also important.

C. Metal mining in Latin America and the Caribbean

This section examines the technology learning trajectories in metal mining in Latin America, a sector which, in various countries in the region, has been instrumental in forging linkages with the global economy.

The favourable international outlook, buoyed up principally by demand from the Asian countries, suggests that a number of greenfield projects and planned capacity expansions will come to fruition. Demand for mining equipment and services is therefore expected to grow, opening up new opportunities for business as well as possibilities for strengthening the production fabric and generating local value added. The mining sector has become increasingly concentrated and globalized in recent years, driven by mega-mergers and acquisitions involving large corporations that have responded to soaring world demand and prices for raw materials, the economic and environmental costs of certain deposits and technological innovations which have led to new opportunities.

Three types of enterprise may be identified in the region: subsidiaries of transnationals, State-owned corporations and companies with a significant percentage of local venture capital. Transnational corporations with a high profile in the global economy have vertically integrated production systems which encompass mining operations, smelting, refining and marketing. Innovation is also concentrated within companies and it derives from their close relationship with major input providers (machinery, equipment and chemicals). In this context, State- and locally-owned companies have strengthened their extraction capacity and their technological strategies, but still act in segments with lower content and fewer technology spillovers.

The scope for local participation is limited and local companies have few prospects of moving up the value chain. Innovations are needed to cut costs and respond to challenges posed by the nature of the deposits; similarly, new practices are needed to minimize environmental impact. More specifically, the industry must be able to extract and process increasingly complex, low-grade ore while satisfying the demand for environmental goods and services. This demand is reflected in various initiatives for regulation of the mining sector, which implies dealing with other key issues such as the competition between mining and other sectors for the use of scarce natural resources.

1. Multinational corporations: production and technology strategies

Starting in the 1980s and intensifying in the 1990s, there was a renewed process of globalization in the mining sector in the framework of companies' internal reorganization strategies, mergers and acquisitions. At the international level, an increasing share of activity corresponds to large corporations with projects in different world regions, whose dealings with each other consist of arrangements to work certain deposits as joint ventures.

The concentration and globalization of the sector, of which the main stakeholders are mining companies from the developed countries (Australia, Canada, United Kingdom and United States), were prompted initially by the following factors: the internal restructuring needed to survive the long cycle of low prices in earlier decades, which led to a greater use of economies of scale; the depletion of certain deposits and the loss of feasibility of others, given stricter environmental regulations and retrofitting costs (especially in the home countries of the major mining companies); the need to control deposits in order to ensure ore supply and thus increase the profitability of concentration, smelting and refining operations; technological progress, which made it possible to work deposits that were previously non-viable, especially spread-out deposits of low-grade ore from which significant quantities of copper and gold could be recovered; new technological applications in prospecting, which reduced timescales and costs and helped to procure more precise information on deposit specifications; and, lastly, institutional reforms, both general and sector-specific, that facilitated investment in Latin American countries with high-grade deposits that could feasibly be exploited on a large scale.[33]

This process has been part of a long-term trend triggered by the expansionary cycle in the global economy, mainly in the Asian countries, especially China, which has become one of the world's largest consumers of tin, copper, zinc, aluminium, nickel and iron. This expansionary cycle led to higher prices for most mineral commodities, together with more intensive efforts in prospecting and working deposits.[34] In this international context, the energy minerals, such as uranium and carbon, have been attracting growing attention as have some industrial minerals including borates, lithium and potassium.

Some developing-country firms are also playing a role in this process of international expansion. The main ones in Latin America are Companhia Vale do Rio Doce (CVRD) of Brazil, which bought the International Nickel Company of Canada Ltd. (INCO) in 2006 for more than US$ 18 billion,[35] and the Mexico Group, which purchased the American Smelting and Refining Company (ASARCO), a lead and copper producer in the United States and Mexico, in 1999 for around US$ 2.5 billion. This group also acquired a controlling share in Southern Peru Copper Corporation in 2005. Conversely, other mining companies, though major local producers with a strong presence in world supply, have yet to clearly define an expansion strategy for foreign operations (Corporación Nacional del Cobre de Chile (CODELCO), Peñoles Group, Mexico).[36]

According to available information (UNCTAD, 2007b), the world's 10 largest metal mining companies accounted for about 30% of output in their respective sectors in 2005.

Recent mergers and acquisitions have likely increased that share as well as shifting the ranking of corporations and their degree of internationalization.[37] As indicated in table V.17, most of the 10 major corporations are based on private capital; the most prominent, given their degree of internationalization (number of host countries where they have operations), are: Rio Tinto, Anglo American, Newmont and BHP Billiton, all of which have operations in the region.

The main transnational mining corporations have at least one technological centre within their corporate structures.[38] The mining industry has had to undertake major research studies throughout its history in order to resolve the difficulties specific to each project and adapt

33 The institutional position is not always favourable. The realization of mining projects can be jeopardized by a negative opinion on mining ventures that is increasingly common in several countries of the region. This is the case of Peru and Argentina, where protests have hindered the progress of projects and some mining activities have even been prohibited (open-pit mining has been banned in the Argentine provinces of Mendoza, Rioja, Chubut and Río Negro). Moreover, mining's intensive use of strategic resources (water and energy) can lead to restrictions on operations in areas where these resources are scarce or reserved for other uses. The sustainable management of such resources is an increasingly important issue in development strategies in the mining sector.

34 Private investments in prospecting of non-ferrous metals increased by close to US$ 2 billion in 2002, reaching an estimated US$ 10.5 billion in 2007. This figure is double the high recorded during the previous cycle of expansion in prospecting, which was US$ 5.2 billion in 1997 (according to Metals Economic Group, 2007).

35 According to UNCTAD (2007b), this is the first time that a company based in a developing country has conducted a transborder transaction of this size. The recent bid by CVRD for Xstrate, a large mining group with diversified global operations based on an agressive strategy of acquisitions (MIM-2003, Falconbridge/Noranda -2006, Jubille Mines Ltd -2007), is part of the same pattern.

36 The Chilean State-owned company CODELCO has conducted only a few prospecting activities in Brazil and Mexico.

37 For some products the level of concentration is even higher. For example, the top 10 copper producers accounted for 58% of world output in 2005; in the case of iron ore, just three companies (CVRD, Rio Tinto and BHP Billiton) produced 75% of the ore shipped in 2006.

38 BHP Billiton operates two centres in Australia (Newcastle and Perth) and another in Johannesburg (South Africa); Río Tinto Group has the Operational and Technical Excellence (OTX) unit with three bases: in the United Kingdom, the United States and Australia; Xstrata has the Technology Services Unit, which comprises two divisions: Xstrata Technology (Australia) and Xstrata Process Support (Canada); Anglo American has Anglo Research, Johannesburg (South Africa); Newmont has the Malozemoff Technical Facility in Denver, United States; and Placer Dome (recently taken over by Barrick) has the Vancouver Research Centre in Canada.

technology to the geological characteristics of deposits. Another factor driving research has been steadily rising operating costs, due to the need to work deeper ore and the operating difficulties that this has implied (lower grade, harder rock, adverse mineralogical conditions). The data available suggest that R&D efforts are, broadly speaking, aimed at overcoming the different constraints and, to a lesser extent, at promoting the sale of technological services.[39] Overall, this process has increased demand for manpower with specific technical skills and competencies, such as geologists, engineers, geophysicists and geochemists, among others (see COCHILCO, 2006a).

Table V.17

THE 10 LEADING MINING COMPANIES, RANKED BY OUTPUT, 2005

Company	**Country of origin**	**Type of ownership**	**Share of world output**	**Number of host countries**
BHP Billiton	Australia	Private	4.8	7
Rio Tinto	United Kingdom	Private	4.6	10
CVRD	Brazil	Mixed (12% State-owned)	4.4	-
Anglo American	United Kingdom	Private	4.3	9
Freeport Mc Moran	United States	Private	3.3	4
CODELCO	Chile	State-owned (100%)	3.2	-
Norilsk Nikel	Russian Federation	Private	2.2	1
Phelps Dodge	United States	Private	2.0	2
Grupo México	Mexico	Private	1.6	3
Newmont	United States	Private	1.3	8

Source: United Nations Conference on Trade and Development (UNCTAD), *World Investment Report 2007. Transnational Corporations, Extractive Industries and Development* (UNCTAD/WIR/2007), Geneva, 2007. United Nations publication, Sales No. E.07.II.D.9.

Transnational corporations work in liaison with universities and internationally competitive public and private R&D centres, which are generally located close to their central headquarters (Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO), AMIRA International, the Julius Kruttschnitt Mineral Research Centre (JKMRC), among others). There are also cooperation networks between mining companies, industry suppliers and the public sector, which carry out R&D in areas of common interest. The research fields are diverse, encompassing processing of materials, smelting, metal refining, geological and mining exploration, underground mining, biomining, automation and sustainable development. They also include the incorporation of more advanced technologies and methods throughout the project life cycle (prospecting, exploitation and mine shutdowns), which increases the scale and capital intensity of their operations (Moussa, 1999; Katz, Cáceres and Cárdenas, 2000; Urzúa, 2007).[40] The technological demands of the mining sector have fuelled the international expansion of companies supplying products and services for the mining industry. The emergence and development trajectory of such companies have varied from one country to another, contributing in some cases to the development of a complex industry with different specialized segments. This process has laid the foundations for the generation of knowledge-intensive clusters acting in the sphere of the global mining industry (Urzúa, 2007).

The industry's suppliers provide a wide range of services and products for the different stages of production and, in some cases, for other sectors.[41] Service providers have accumulated a body of

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[39] Some corporations, such as Xstrata and Phelps Dodge, have specific technological units or branches for the sale of their own innovations and technological services. In the case of Xstrata, these include flotation systems, grinders and cells, among others; in the case of Phelps Dodge, they include nanomineral technology.

[40] Investments in deposits that require the removal of massive amounts of gangue and minerals (copper, gold or silver), which are currently the most common type owing to the depletion of seam deposits, often exceed US$ 1 billion and may amount to as much as US$ 5 billion when they include expansions for further exploitation.

[41] Mining industry suppliers may be divided into four main categories which are related to investment projects as well as operations underway and mine shutdowns: knowledge-intensive service consultants, specialized services contractors, providers of capital goods and equipment and providers of consumer inputs (Urzúa, 2007). The knowledge-intensive service providers group (services such as prospecting, geological studies, project management, mine-design, automation and blast engineering) is very diverse and in constant

knowledge through their interaction with mining companies in developing specific solutions in a wide variety of projects, which often require a range of skills and the integration of different technologies. In this regard, competence-building has become something that happens in networks, although for decades it took place within mining companies themselves, in the times of vertical integration (Urzúa, 2007).

2. Technology and production trajectories in Latin America

The region (particularly Chile and Peru) accounts for a substantial proportion of global output of ores and refined metals (see table V.18). Bolivia, Brazil, Colombia, Cuba, Jamaica, Mexico and Suriname also account for a very large share of world mining production. Indeed, the region is a significant global player in this sector.

Table V.18
LATIN AMERICA AND THE CARIBBEAN: SHARE OF MINING OUTPUT (PITHEAD/REFINED METAL), 2006
(Percentages)

Country	Antimony	Bauxite (aluminium)	Bismuth	Copper	Gold	Lead	Molybdenum	Nickel	Silver	Tin	Zinc
Argentina	2.9	(0.8)		1.1 (0.1)	1.4	0.2 (0.6)			0.7	(0.0)	0.29(0.4)
Bolivia			0.5	0.0	0.4	0.2(0.0)			2.3	5.36 (4.3)	1.6
Brazil		12.2 (4.7)		0.9 (1.3)	1.8	0.4(0.7)		2.56(2.3)	0.7	3.6 (2.4)	1.7(2.5)
Chile				35.2(16.1)	1.9	0.0	23.3		8.5		0.3
Colombia				0.0	0.7	(0.1)		3.6 (3.9)	0.0		
Cuba								5.2 (3.1)			
Ecuador					0.2						
Guatemala	0.4										
Guyana		0.8			0.3						
Honduras					0.2	0.3			0.3		0.4
Jamaica		8.3									
Mexico	0.5		23.2	2.2 (2.4)	1.8	3.5 (3.4)	1.3		15.9		4.7 (3.6)
Nicaragua					0.1				0.0		0.0
Peru	0.5		14.7	6.8 (2.9)	9.4	8.3 (1.5)	9.3		18.4	11.8 (11.8)	11.8 (1.6)
Dominican Republic								2.09 (2.2)			
Suriname		2.7									
Trinidad and Tobago						0.0					
Venezuela (Bol. Rep. of)		3.2 (1.8)			0.4	(0.4)		1.2 (1.4)			
Latin America and the Caribbean	**4.2**	**27.2 (16.3)**	**38.4**	**46.4 (22.8)**	**18.5**	**13.2 (6.7)**	**33.9**	**14.7 (12.9)**	**46.8**	**20.8 (18.5)**	**20.8 (8.2)**
World total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of World Bureau of Metal Statistics, *World Metal Statistics Yearbook, 2007.*

Table V.18 also highlights the discrepancy between the shares of mining output and refined metal production. This reflects the fragmentation of the production chain, in which the different phases from extraction to concentration are carried out in the region, while subsequent processing is

flux. In general, these are not "pure" providers insofar as some equipment providers have been integrating services while others have incorporated different knowledge-intensive activities (thus, explosives suppliers provide detonators and accessories as well as blast engineering services; engineering and project management firms integrate contractor services in areas relating to construction and development).

done abroad. This is due to a number of factors. First, most mines are operated by transnational firms whose smelting and refining infrastructure must be operated at full capacity to maintain its profitability. Second, refining costs are lower in certain regions owing to special incentives for the location of these industries (one of the outcomes being that companies actually operated at excess refining capacity until the boom in this market in 2003) and to environmental regulations that are more lenient than those applied in Latin America and the Caribbean; and lastly to the lack of energy infrastructure in various countries of Latin America and the Caribbean, which adds significantly to smelting and refining costs or even makes them unviable.

As noted earlier, three main types of actors may be distinguished in mining: subsidiaries of transnational corporations, State-owned corporations and private companies with a significant share of local capital. Some of the features of the latter two types of company are discussed in box V.6, with an emphasis on their technological performance. State-owned and private local companies have generated technology learning processes even though, in general, these are predominantly endogenous and still have a limited impact on the development of local innovation networks.

Box V.6

STATE-OWNED ENTERPRISES AND FIRMS WITH A LARGE PROPORTION OF LOCAL CAPITAL

State-owned enterprises. This is a group with limited influence, the sole exception being CODELCO, which is an autonomous Chilean State-owned company and the only State-owned enterprise in the countries examined which is a leader in large-scale mining (copper). Currently, CODELCO accounts for approximately 30% of mined copper production in Chile and a significant proportion of mining exports, with a high proportion of higher value added products in its external sales (76% of copper cathodes, compared with only 38% for other companies in 2006). CODELCO is the largest copper producer in the world (with 11% of world supply in 2006) and it owns approximately 20% of world reserves. The company embarked on a thorough-going process of technological modernization in the 1990s, replacing equipment and introducing control instruments and techniques, and developing highly profitable new projects with the incorporation of new hydrometallurgical technologies (Moguillansky, 1998).

The broad experience CODELCO has built up in copper mining and metallurgy has enabled the company to continue upgrading its processes by adapting technology from abroad and making significant contributions to technological innovation (for example, the modified Teniente converter and subsequent upgrading). In recent years, it has built up its own capacities in biohydrometallurgy and underground mining. Until the 1990s, the company’s innovation efforts were part of its policy of “reactive innovation”, i.e., innovation directed at solving its own operating difficulties. Subsequently, CODELCO entered a new phase of fostering innovation with a high impact on production processes (the Teniente converter, bioleaching, underground mining, in-situ biotechnology, robotics and open-pit mining (COCHILCO, 2005).

Companies with a high percentage of local investment capital. Large private companies with a high percentage of local capital are also involved in large-scale metal mining. The way these firms have evolved has been influenced by the particular characteristics of the respective countries. Some of them account for the bulk of local supply and are very active internationally (CVRD in Brazil, in which the State is a minority stakeholder, and Peñoles mining group in Mexico), while others have a smaller role on the international stage but work large deposits (Antofagasta Mineral of the Luksic Group and Compañía de Minas Buenaventura of the Group Buenaventura of Peru).

As a result of the market positioning strategies in which they have specialized, these firms have tended to modernize long-standing operations, increase operating efficiency, expand capacity and incorporate modern technologies for working large-scale deposits. In general, human resources skilled in using the new technologies are contracted through agreements with local and foreign universities. These companies usually form joint ventures with foreign companies in order to mine large-scale deposits or undertake capacity expansion (CVRD, Peñoles Group, Luksic Group).

Most of the companies carry out research into specific problems arising with their deposits. Some mining companies have their own R&D centres (CVRD and the Peñoles Group) or establish various forms of alliances with universities and research centres, mining companies and suppliers. On the whole, companies show little interest in covering their requirements through long-term R&D. The learning curve of CVRD-Brazil may be viewed as an exception, as many of its initiatives have been conceived as a result of in-house R&D. In addition, the company has signed agreements with universities, research centres and local and foreign clients.

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

It should be recalled that metal-bearing resources are also exploited by small-scale and medium-sized mining operations —including artisanal mining, which typically shows little mechanization or technological development. In many countries, such companies benefit from State support and mid-sized companies receive assistance to enable them to access subsequent stages of production (concentration, smelting and refining) and to cope during low-price phases of the business cycle.

The subsidiaries of transnationals are little inclined to carry out R&D locally or to generate learning processes that would enable upgrading of local firms.[42] Their dealings with public institutions (universities, research centres) and with equipment suppliers are conducted mainly in their respective countries of origin or in other developed economies. These companies position themselves at the heart of the value chain, where both learning processes and the sector's income are centralized.

These subsidiaries often form joint ventures with other transnational corporations and also with local companies to work deposits, almost exclusively for the external market. They operate relatively new, high-grade deposits and use state-of-the-art technology (developed by themselves or third parties) throughout the project life cycle. In general, the process is developed from outside the country: the engineering work is assigned to major international consultants and the operation typically involves the subcontracting of a considerable number of services. Companies meet their requirements for skilled human resources by making training arrangements with subcontractors or by setting up training centres and entering into agreements with universities or other public institutions.

Thus, well-formulated public strategies and local capacity-building are essential in order to enter the high-technology segment. Some of the countries examined have installed capacity for the development of mining-related careers in laboratories and universities; nevertheless, some centres face limitations in terms of the level of excellence needed to respond to competitiveness issues in the mining industry and the availability of sufficient specialized human resources for the different areas of prospecting, mining and metallurgy.[43] For example, biotechnology, which offers new opportunities in the sector, calls for projects and policies for training human resources that are highly specialized in these areas.[44]

There are signs that State-owned and local capital firms have generated greater local capacities as a result of mining. Technology learning in the sector is not confined to the large mining corporations; there is also a network of goods and services suppliers that benefit from the technological stimuli and demand generated by the larger enterprises. CODELCO is a case in point, since the firm's alliances with international companies, universities and public centres have made it possible to carry out strategic research projects.

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42 Most of these firms operate in the countries under consideration, in both the prospecting and the mining phases (BHP Billiton, Rio Tinto, Anglo American, Freeport, Newmont, Barrick and Xstrata). However, their relative importance in the production of metal-bearing minerals and, hence, their prominence in the sector differ from one country to another: they account for almost the entirety of mining operations in Argentina, approximately 85% in Peru, slightly under 60% in Chile, and between 15% and 20% in Brazil and Mexico, respectively (UNCTAD, 2007b). Only in a few isolated cases do they participate in technological alliances with other local mining companies in areas of common interest (for example the alliance between CODELCO and BHP Billiton).

43 Four areas (among others) may be highlighted: (i) the use of satellite methods and geological information in the prospecting phase, satellite remote sensing; airborne electromagnetic sensors and geophysical drilling technologies; (ii) software for data processing and deposit imaging, computerized engineering processes for mine design, process optimization and planning and fleet management; (iii) technological advances applied to mineral extraction and processing in connection with the use of more sophisticated drilling equipment suitable for the type of operation (open-cast or underground mining), as well as the incorporation of trucks with increased load-carrying capacity; and (iv) the introduction of the solvent extraction method in the hydrometallurgical process, the bioleaching process and refining by electrowinning for extracting metal from oxidized copper ore.

44 Bioleaching or leaching of metals using micro-organisms is now considered to be one of the hydrometallurgical techniques of the future for the treatment of low-grade minerals, concentrates and tailings. Their advantages include: low investment capital (the bacteria can be separated from the acid waste water); the low cost of the hydrometallurgical operations in comparison with conventional processes; relatively little environmental pollution or contamination during the process; and the capacity to process increasingly large quantities of low-grade ore which cannot be processed economically using traditional methods.

Irrespective of the type of enterprise involved in the major metal-mining sector, most of the equipment, inputs and services required are supplied by firms with a well-established global presence and which are based in Asia, Europe or the United States, and more recently in Australia, Canada and South Africa (COCHILCO, 2006b). International firms that provide technologically highly complex equipment and machinery, some of which are also suppliers of mining inputs, have a large market share in the countries of the region. Increasingly, they also provide maintenance and repair services (in many cases within mining operations themselves) and even highly specialized engineering services.[45] In general, these manufacturers have a diversified line of business and few competitors for their products, and they often have R&D centres engaged in developing innovative products and services. Their commercial strategy revolves around establishing an operations centre in a Latin American country or having local firms represent their products; this has on occasion facilitated the local supply of inputs and parts, as well as the expansion of local engineering and service provision capacities.[46]

Local manufacturers of equipment and accessories have played an important role in domestic supply in some countries and, in some cases, have even gained prominence in the regional market.[47] Thus, rapid growth in the sector in Chile has led to a rise in both the number and the complexity of manufacturers of equipment and accessories for drilling, pneumatic pick systems, fans, furnaces, rotary kilns and conveyor belts. Some of these supply firms have been taken over by global leaders (Katz, Cáceres and Cárdenas, 2000), which seems to indicate, first, the existence of complementary local capacities important enough to attract major companies wishing to buy them out and, second, the need to formulate policies on financing and technology to stimulate these capacities, so that local companies can continue their learning trajectory and better position themselves for negotiations with major firms.

In terms of the inputs required for mining, foreign suppliers have a large presence in the countries of the region, reflecting a similar pattern to that of the mining equipment and machinery segment.[48] However, local supply firms, too, have consolidated their operations in domestic markets and have, in some cases, started to export, mainly to other countries in the region. Local firms produce abrasives, abrasion and structural steels, drill steels, steel cables, steel chains and tubes, sulphuric acid, grinding equipment, explosives and blasting accessories, gases and solder, fuels and lubricants.[49]

Owing to the magnitude of the projects involved, mining companies tend increasingly to contract major international consultants to provide integrated engineering, project management, acquisition and construction services. Depending on each country's capacity, these major

[45] The equipment and machinery include: pumps and hydrocyclones, trucks for open-pit mining, front-end loaders, underground mine trucks, crushers, conveyor belts, load-haul-dump (LHD) equipment for concentration plants, drilling equipment, test drilling equipment, ancillary and earth-moving equipment, automation equipment as well as grinders and motors.

[46] The leading international equipment and machinery suppliers are: Sanvik (Sweden) for LHD equipment; Outokompu (Finland) and Dorr Olivar Emco (Canada) for concentration plant equipment, Caterpillar (United States) for open-pit mine trucks, front-end loaders, ancillary and earth-moving equipment, and engines; Komatsu (Japan/United States) for open-pit mine trucks; Metso Minerals (Finland) for crushers and grinders; KSB (Germany) for pumps and hydrocyclones; Atlas Copco (Sweden) for drilling equipment for underground and open-pit mines, and test-drilling equipment. (COCHILCO, 2006b).

[47] Local companies that supply equipment include: Drillco and Implemin Corporate Group of Chile (the latter was recently taken over by Sanvik of Sweden) and PW Hidropneumática of Brazil for equipment and drilling accessories; Metalurgica Revesol and Caucho Técnica of Chile for conveyor belt parts and components; Conymet of Chile for hopper wagons; etc. (COCHILCO, 2006b).

[48] Apart from the suppliers of equipment and machinery who provide parts and components, mention should also be made of the following: 3M Mining (United States) for abrasives, SSAB (Sweden), Atlas Copco and Sanvik (Sweden) and Boart Long Year for drill steel; Magototteaux (Belgium) for grinding equipment; Orica Mining Services (Australia) for explosives and blasting accessories; Bridgestone (Japan) and Michelin (France) for tyres; Good Year (United States) for conveyor belt parts and components; Shell (United Kingdom) for fuels and lubricants (COCHILCO, 2006b).

[49] For example: Enaex of Chile and FAMESA Explosivos of Peru for explosives and blasting accessories, which have majority shares of their respective markets; the IMSA Group of Mexico, Companhia Siderúrgica Nacional (CSN) of Brazil and Compañía Siderúrgica Huachipato (CSH) of Chile for steel products that are exported to other countries in South America; Inacesa of Chile, Cementos Lima of Peru and Vaesa of Mexico, which provide cement locally; Moly Cop and Productos Chilenos de Acero (Proacer) of Chile and Metalúrgica Peruana of Peru for steel balls and bars for grinding media; and Petrobras (Brazil) for fuels and lubricants. (COCHILCO, 2006b).

consultants subcontract local engineering firms specialized in specific fields, or else the latter form alliances with international firms in order to compete in the market. In some cases, local engineering firms have become leaders in their domestic market.

Local firms tend to play a greater role in general services, which encompass a very diverse range of activities (machinery rental, transport of personnel and cargo, waste disposal, provisioning, training and maintenance). However, services relating to maintenance, repairs and blasting are generally provided directly as part of mining operations by the companies that supply these goods, which in many cases are leading foreign-based firms that operate globally, but hire local staff to provide these services.

Local capacities also exist under the heading of specialized consultancy, such as environmental services, chemical laboratory services, integrated geodetic measurement services, water treatment, information and management systems and legal support. In the particular case of ICTs applied to mining, business is mainly handled by a small number of global companies (Datamine, Maptek, Gemcom, Mincom, among others) and possibly, as has occurred in Chile, local firms act mainly as integrators of technologies imported from other countries.

Lastly, rising demand for environmental goods and services in old and new live projects reflects the need for development of technologies relating to the use and management of water and waste water; solid waste management; control of atmospheric emissions and air quality; energy efficiency and use of renewable energies; shutdown of mining operations and installations; and risk assessment and liability management. Such necessities generate incentives for the creation and development of diverse capacities in areas such as geosciences, metallurgical technologies, engineering services and environmental services, mining software and new equipment. All this requires human resources training in specialized mining and metallurgy and R&D activities, for which it is essential to tighten links between research centres and universities, on the one hand, and industry, on the other.

In short, there is evidence that some local capacities have been generated as a result of mining, especially in specific niches. Technology learning in the sector is not limited to the major mining companies; instead, there is a network of goods and services providers that benefit from technological incentives and demand. It is crucial to develop and deepen this network if the mining sector is to play a role in the economic development of the region.

As regards learning, different patterns have emerged, with the subsidiaries of foreign firms proving less likely to carry out local activities. In other words, they appear to make only a small contribution to the development of local technological capacities through R&D activities, relations with providers and linkages in these areas. In turn, the tendency to rely on the external market as a source of machinery and equipment, inputs and services limits the development of externalities and the capacity to retain the value generated by mining activities.

D. Services: specialization and technology learning

This section provides an overview of the current standing of the Latin American and Caribbean region, as well as the challenges and opportunities it faces, in the global market for services. Particular attention is paid to tourism and the so-called "other services", which include business, professional, computer, information, construction, architectural, engineering, medical and advertising services. [50]

[50] "Other services" is an accounting term taken from the International Monetary Fund (IMF) *Balance of Payments Manual*, fifth edition. "Other services" comprise those not covered under transportation and travel (tourism).

The international trade in services poses tremendous opportunities for Latin America and the Caribbean to diversify and add value to their exports. Mexico and the small economies of Central America and the Caribbean are in a particularly advantageous position for hosting offshored or subcontracted business services thanks to their close geographical proximity to the United States, the relatively low cost of skilled labour and the widespread availability of information and communication technologies (ICTs). [51] Several of the countries in these subregions also have considerable potential to diversify their supply of tourism products and to improve links between the tourism sector and the local economy. Meanwhile, the presence of considerable volumes of foreign direct investment (FDI), shared service centres (SSC) and transnational corporations have made the region's large economies, such as Argentina, Brazil, Chile and Mexico, attractive locations from which to export services.

This section is divided into four parts. The first summarizes the main trends in trade in services in the region. The second paints a picture of the patterns of "other services" in the region through an examination of four specific cases. The third assesses the situation of the tourism sector. The fourth and last part identifies the key elements for the generation and diffusion of technological capacity in the sector.

1. Trends in the international trade in services

Services today represent approximately two thirds of the GDP of the developed countries and almost half the GDP of the developing countries in the world. The sector accounts for 70% of jobs in developed countries, but only a third of jobs in emerging economies. Cross-border trade in services has tripled since 1990, while FDI has quadrupled. Emerging economies have expanded their service exports at a rate exceeding that of developed countries (UNCTAD, 2004 and 2005b; ECLAC, 2006c and 2007a). Services are essential inputs for many activities and play a crucial role in increasing economic growth and productivity by improving financial intermediation, infrastructure, the use of information and communication technologies (ICTs), education, health and the State apparatus.[52]

The growth rate of service exports from Latin America and the Caribbean between 1985 and 2005 was lower than that of Asia and the world as a whole. Over the course of those two decades, service exports multiplied by 4.5 in Latin America and the Caribbean, 6.2 worldwide, 8 in ASEAN countries and the Hong Kong Special Administrative Region of China, 14 in India and 24 in China (see table V.19). Guatemala, Chile and Costa Rica displayed the highest growth rates for services in general (ECLAC, 2007a).

Worldwide, "other services", which comprises all services except transport and tourism, has been the most dynamic services segment in the past two decades. In Latin America and the Caribbean, however, the expansion of this segment has been slower than in Asia and in the world as a whole (ECLAC, 2007a). In this category, Argentina, Brazil, Costa Rica, Honduras and Paraguay recorded the highest growth rates, with the largest share of exports in 2005 being generated by Argentina, Brazil and Paraguay (see table V.19). The most notable growth in transport services was witnessed in Chile, Guatemala, Paraguay and El Salvador. Tourism (travel) services increased at over 20% a year in Brazil, Cuba and Guatemala.

[51] Companies initially offshore certain stages of their production process in order to lower costs (UNCTAD, 2004). With time, however, the improved quality of the services provided becomes an increasingly important factor (Dossani and Kenney, 2003). Outsourcing also goes hand in hand with "fragmented" production, whereby companies from developed countries can increase the competitiveness of their final product because the freeing up of resources enables them to concentrate on the higher value added stages of production (Markusen and Strand, 2006).

[52] For information on the micro-level fundaments and determining factors of the services economy, see Jansson (2006).

Table V.19
SERVICE EXPORTS: LEVELS, COMPOSITION AND ANNUAL GROWTH RATES, 1985 AND 2005

	1985				2005				Average annual growth			
	US$ billions	Composition (percentages)			US$ billions	Composition (percentages)			Total	Trans-port	Travel	Other
		Trans-port	Travel	Other		Trans-port	Travel	Other				
Latin America and the Caribbean												
Total	16.5	33	49	19	74.2	22	52	26	7	5	8	9
Andean Community[a]	2.6	39	37	24	6.8	29	52	19	5	3	7	4
Central American Common Market[b]	0.6	27	33	40	5.5	15	64	21	12	8	15	8
MERCOSUR[c]	4.0	59	22	20	20.7	22	32	46	9	3	11	13
Argentina	1.5	56	32	12	5.6	22	44	34	7	2	9	12
Brazil	1.9	73	3	24	13.3	21	27	52	10	4	22	14
Mexico	4.5	13	70	17	15.0	10	75	14	6	5	7	6
CARICOM	2.7	13	76	10	8.7	12	69	19	6	5	5	9
Other countries[d]	2.1	44	36	22	17.3	42	40	17	9	9	10	8
Chile	0.6	42	18	40	6.5	58	18	24	12	14	12	9
Asia (selected countries)												
China	2.9	45	33	22	68.0	20	40	39	17	13	18	21
Hong Kong (SAR of China)	7.4	42	25	33	58.6	31	16	52	11	9	9	13
India	3.2	16	26	59	45.8	11	13	76	14	12	10	16
ASEAN	11.4	23	39	38	92.1	32	34	42	11	13	10	12
World	400	33	30	37	2 420	23	28	48	10	8	9	11

Source: Economic Commission for Latin America and the Caribbean (ECLAC), 2007, on the basis of data supplied by the International Monetary Fund (IMF), "Balance of Payments Statistics (BOP) database" [online] http://www.imfstatistics.org/bop.

[a] Bolivarian Republic of Venezuela, Bolivia, Colombia, Ecuador and Peru.
[b] Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua.
[c] Argentina, Brazil, Paraguay, Uruguay.
[d] Chile, Cuba, Dominican Republic, Panama.

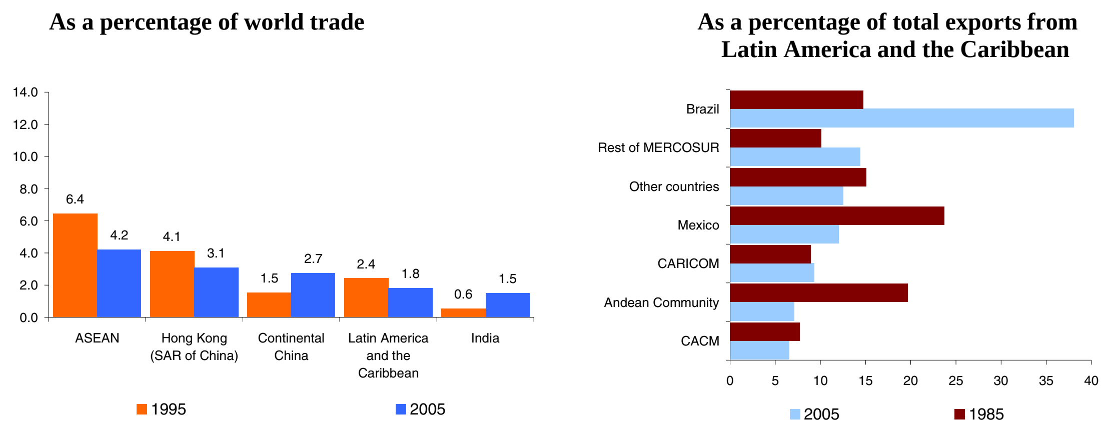
2. Performance and trajectory of the "other services" segment

Many of the "other services", especially those provided to companies, are based on the intensive use of knowledge in fields such as accounting, human resources management, legal advice, informatics services and programs, medicine, R&D, architecture, engineering, construction, advertising, logistics, maintenance, mining, maquila and biotechnology. Obviously, the actors involved, the morphology of the markets and the levels of technology and knowledge required in these activities vary considerably, as do their links with other activities. The spread of ICTs has facilitated the export of services and increased the possibility of delegating them, which has enabled companies to subcontract suppliers anywhere in the world according to which can offer the best price-quality ratio. This process has been the key component of the expansion of the business services trade and accounts for the increasing specialization of the sector and its stronger insertion in value chains (ECLAC, 2007a; López, Ramos and Torre, 2008).

The main markets for "other services" are the countries of the Organisation for Economic Co-operation and Development (OECD), which absorbs over three quarters of global service imports. Although most of the services trade is carried out among developed countries, several developing countries have managed to penetrate the market thanks to their ability to provide skilled human resources at relatively low costs. The performance of certain Asian countries, such as China and India, has been particularly notable in this respect, largely due to the huge pools of labour that they can supply. Other East Asian and Latin American countries are also gaining footholds in the services markets, but on a far smaller scale than the Asian giants, mainly because they simply cannot offer the same mass of human resources. The Latin American and Caribbean region's share in the worldwide trade in services in fact fell between 1995 and 2005 from 2.4% to 1.8% (see figure V.6).

Figure V.6

EXPORTS OF "OTHER SERVICES": SHARE IN WORLD TRADE AND LATIN AMERICAN AND CARIBBEAN EXPORTS, 1985 AND 2005



Source: Economic Commission for Latin America and the Caribbean (ECLAC), 2007, on the basis of data supplied by the International Monetary Fund (IMF), "Balance of Payments Statistics (BOP) database" [online] http://www.imfstatistics.org/bop/.

The sluggish performance of Latin America as a whole conceals huge variations within the region. Brazil and the other countries of the Southern Cone Common Market (MERCOSUR) recorded the strongest performance. Brazil's share of Latin American exports of "other services" rose from 15% to 38% between 1985 and 2005. The Andean Community and Mexico posted the weakest results in this sub-category. Mexico in fact, at the end of the period, lost its position as the region's leading exporter to Brazil.

The potential that the region's companies/countries have to export "other services" largely depends on their ability to insert themselves into pertinent global value chains (GVCs). How they insert themselves will also determine the sustainability of their position as an export company/country and the impact of their exports on the respective economies of origin.

Participating in global value chains can pose opportunities for emerging economies to increase exports and generate jobs, but there is no guarantee that there will be other positive repercussions, such as the generation of knowledge spillovers or the accumulation of technological capacity. In some circumstances, however, an upgrading process might occur, if knowledge-intensive activities gradually replace activities whose competitiveness is based only on low costs and entry barriers.

These issues will be examined in light of four case studies: shared service centres, business services, clinical trials and advertising services.[53] In these cases, the pertinent GVCs function according to different modalities, and the modes of insertion also vary.

53 See a complete analysis of these cases in López, Ramos and Torre (2008) and ECLAC (2007h).

3. Shared service centres

Shared service centres (SSCs) are centres or businesses that are set up by transnational corporations to provide services to their head office or their subsidiaries or both. They are part of the worldwide offshoring process being undertaken by transnational corporations. This process aims to lower costs by eliminating overlapping activities, standardizing administrative processes and increasing specialization in tasks that require considerable training of the human resources involved. Most SSCs are situated outside the country in which the transnational corporation's headquarters are located in order to take advantage of the conditions under which services can be provided in other countries. The link between the SSC and headquarters is strong, and the tasks the SSC performs are constantly reviewed and monitored (KPMG, 2007).[54] These kinds of centres have emerged in Eastern Europe (Czech Republic, Hungary), Asia (China, India and the Philippines) and some Latin American countries.

SSCs continue to be a minor activity in Latin America. Those that exist focus on providing services to companies' regional or worldwide business units. For cultural and strategic reasons, most of the SSCs in the region supply services to Latin American subsidiaries, although some serve head offices in the United States and even subsidiaries on other continents. Examples of shared service centres in the region include: the SSC set up by the multinational Unilever to centralize all the financial services for its Latin American subsidiaries (except in Brazil) and the SSCs established by Air France and Delta Airlines to centralize their customer services in the region. Telefónica provides back office services to several of its Latin American divisions from its SSC in Argentina. ExxonMobil and Chevron have set up SSCs in Argentina. Procter & Gamble, Baxter America and Intel, among others, have set up centres in Costa Rica (ANDI, 2005; Piña, 2005; UNCTAD, 2004). Multinationals tend to supply informatics services and programs directly, subcontract them to third parties or arrange for them to be provided through alternative modalities that range from software factories to more complex structures such as ICT-enabled services (see box V.7).

Given the minimal links between SSCs and the economies in which they operate, doubts have begun to be raised about whether they have the potential to generate positive externalities in the form of knowledge transfers. As SSCs either function as an internal unit within a transnational corporation or are managed by a company that provides services to other companies, usually at the worldwide level, independent local companies in the host countries are highly unlikely to be able to set themselves up in the business. SSCs do, however, create jobs for workers with mid-level skills and generate foreign exchange income for the host country (as their activities are usually highly export-oriented). The type of services they provide can also generate economies of scale. Countries might therefore be justified in implementing public policies that make them attractive destinations for investment in these activities (López, Ramos and Torre, 2008). Shared service centres are also highly mobile, however, and can relocate anywhere in the world. Policymakers therefore need to focus not only on offering low costs, which are a static comparative advantage, but also on building technological capacity, which is a dynamic comparative advantage. Although Latin America's participation in SSC activities has in general been marginal, in Central America and the Dominican Republic, there has been a noticeable increase in the export of services provided by contact centres, business process outsourcing (BPO) and shared service centres. These activities have turned out to be an alternative source of work to the maquila industry and require workers with higher skills levels than those demanded in the traditional textiles and clothing sector (see box V.8).

[54] According to a survey performed by Frost & Sullivan (2005), the functions that could be concentrated in an SSC but are often outsourced instead are: customer services (56% of the companies surveyed), IT services (51% of the companies surveyed) and human resources (48% of the companies surveyed). On the other hand, companies tend to keep their R&D activities (77% of the companies keep surveyed), as well as sales (78% of the companies surveyed) and procurement (60% of the companies surveyed) within the corporation and in the home country (and possibly in an SSC).

Box V.7
THE EXPORT OF ICT-ENABLED SERVICES FROM LATIN AMERICA

Several shared service centres have recently been set up in Latin America to centralize one or more corporate functions of a company's various divisions. Call and contact centres have also been established to provide customer services by telephone or, lately, at an increasing rate, by "virtual" contact though the Internet. Although these kinds of centres have existed throughout the region since the 1980s, it is only in the last few years that they have begun to export their services. The first export-oriented call centre in Mexico, for example, was set up in Monterrey by the company Hispanic Teleservices in 1999 (Aragón, Campos and Fouquet, 2007). Contact centres offer services ranging from customer services to the supply of after-sales technical backup, general support, telesales and tele-collection services. These centres handle both inbound and outbound calls. Inbound calls (in which user requests are received, technical or commercial consultations are made or advice is sought, among other activities) generally require a greater level of specialization on the part of the service provider than outbound calls. The outsourcing of inbound types of customer services is therefore arranged under contracts that establish a high level of interdependence between the service provider and the client company, and the former is usually required to become closely involved in the activities of the latter (Piña, 2005). Call centres today provide thousands of jobs to people in Latin America: of the 630,000 workstations that migrated worldwide in 2006, 20% (25,000) migrated to Latin America (Mac Donald, 2007). In Argentina, for example, where call centres are estimated to employ over 50,000 people, approximately 50% of the US$ 310 million billed in 2006 (US$ 160 million) corresponded to outsourced jobs. About 66% of foreign sales were made to the United States, 24% to Spain, 8% to Latin America and the remaining 2% to other countries. (AmCham, 2006 and Hansen, 2007). In Latin America, transnational corporations, such as Accenture, EDS, IBM, the Indian company TCS and others, are some of the large call-centre operators in the region. For these companies, Latin America is not just a market but also, and increasingly, a base for the production of services (Bastos Tigre and Marques, 2007). About 50% of the total sales of Accenture's Argentine subsidy correspond to export services, and 70% of the sales made by Sykes' subsidiary in Argentina, Apex, is destined for the Hispanic market in the United States. TCS, meanwhile, has a third of its personnel in the region working in Chile and Uruguay, which shows that the hunt for human resources bears no relation to the size of the local market. With a few exceptions, the large call-centre operators in Latin America are transnational corporations like the French company Teleperformance (which has over 29,000 employees in the region, a significant portion of whom are engaged in exporting services), the United States company Teletech and the Spanish corporation Atento, which is part of the Telefónica group.

The operations of the transnational corporations that outsource services in Latin America vary considerably both in terms of complexity and the markets they target. The situation in Argentina illustrates this well: companies such as EDS and Accenture basically compete in segments that are characterized by low labour costs and relatively routine activities; INTEL and Motorola are engaged in activities related to innovation and R&D (creating programs for their IT products); while IBM seems to be specializing in certain niches in which it can compete regardless of labour costs (López and Ramos, 2007a). Although the fact that the region is becoming an attractive location for the outsourced operations of transnational corporations (or that many companies from developed countries are choosing the Latin American subsidiaries of multinationals to provide outsourced services) is a positive sign, it also reveals a lack of confidence in local companies stemming from, among other causes, problems of prestige, scale, technical specialization or information. For now, the opportunities for exporting services from Latin America seem to be being seized primarily by transnational corporations. One of the few regional service companies that has managed to penetrate foreign markets is the Mexican firm Sofftek, which functions as a nearshore outsourcing operation that provides professional services to the United States market. Sofftek invoiced US$ 140 million in 2005 to become the most important outsourcing company in Mexico. It now has two international development centres, one in Brazil and one in Spain (Mochi and Hualde, 2007). The Uruguayan group Quanam is another example of a relatively successful local outsourcing company: it exports two thirds of its production and has a market presence in nine countries in the region (González and Pittaluga, 2007).

Source: A. López, D. Ramos and I. Torre, "La exportación de servicios: ¿puede América Latina insertarse en las cadenas globales de valor?", Working Paper, Santiago, Chile, Economic Commission for Latin America and the Caribbean (ECLAC), 2008, unpublished.

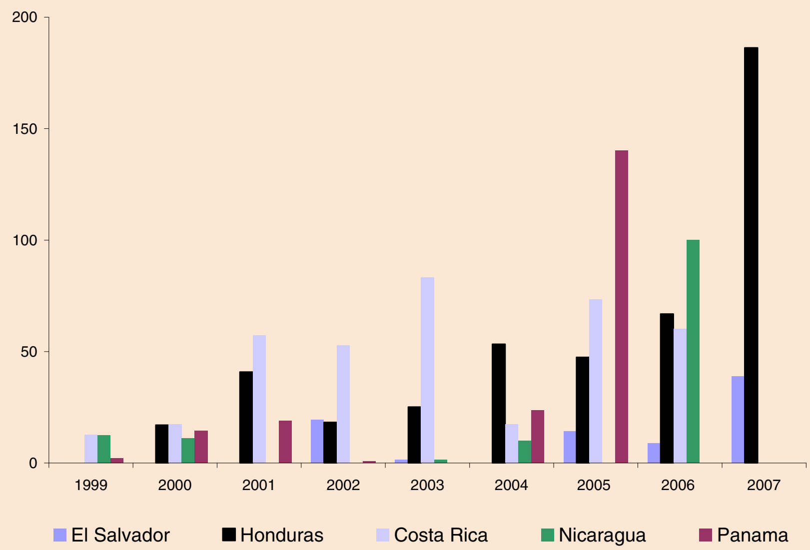
Box V.8

SERVICE EXPORTS: NEW OPPORTUNITIES FOR CENTRAL AMERICA AND THE DOMINICAN REPUBLIC

Efforts to attract new kinds of foreign investment in Central America and the Dominican Republic are currently focusing on exported services (call and contact centres, business process outsourcing (BPO), shared service centres and others). The attraction of these services lies in their potential to create relatively well-paid jobs. Although official FDI statistics on do not distinguish between exported services and other kinds of services (those that target local consumers and are not included in specific statistical categories), the announced investments in the segment strongly imply that it is currently experiencing a small boom.

FOREIGN INVESTMENT IN SERVICES, EXCLUDING PUBLIC SERVICES AND COMMERCE

(Millions of dollars)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of official data. No information available for the Dominican Republic or Guatemala.

Note: El Salvador: services exclude commerce, construction, telecommunications and financial services (estimates based on annual differences in capital stock); Honduras: real-estate and business services; Costa Rica: services exclude financial, tourism and real-estate services; Nicaragua: "other services" excludes commerce, electricity, construction, communications; Panama: real-estate, business and rental services (estimates based on annual differences in capital stock.).

At the moment there is window of opportunity for capturing investment in international services, especially ICT-enabled services, as companies are seeking to relocate in countries outside the traditional service centre circuit. In Asia, the countries that make up the traditional circuit are showing signs of saturation, and rising labour costs are pushing up operating costs. Lower costs, untapped labour pools and first-mover advantages are making other destinations more attractive (MIGA/ Commonwealth Secretariat, 2007). Upon finding the situation less favourable in their home country (India, the Philippines), some service providers are seeking out new locations for their operations and exploring the advantages of diversity. In Guatemala, for example, of the 15 forthcoming investments in call centres and business process outsourcing services, two were announced by Indian enterprises and two by companies from the Philippines (Invest in Guatemala, 2007). Nearshoring, which means moving operations closer to the target market with a view to taking advantage of cultural affinities, similarities of accent and other characteristics not attributable to cost, is also becoming increasingly popular. There are various opportunities for nearshoring in the region. The English-speaking Caribbean has advantages over India, for example, for serving North American customers (MIGA/ Commonwealth Secretariat, 2007).

In El Salvador, the Law on International Services, which came into effect in November 2007, provides for tax incentives, special parks, service centres and guarantees for investors in the sector. Together with the initiatives underway to improve secondary-level technical and tertiary-level technological education, as well as English-language training, these efforts are improving the prospects of this Central American country. El Salvador now, together with Costa Rica, has the highest number of jobs per capita in business services (IBM Global Business Services, 2007). India and the Philippines have the largest number of jobs in business services in absolute terms, while Costa Rica accounts for 2%, and El Salvador and Mexico for 4% each, of the jobs in this sector.

Box V.8 (concluded)

Over 17,000 people in the Dominican Republic are today employed at the approximately 50 contact centres operating in the country. With the opening of the Cybernetic Park of Santo Domingo, the authorities hope to increase investment in the sector by providing a favourable climate for IT-based business services (contact centres, BPO, informatics product creation and design) and related manufacturing enterprises. To complement this effort, the Technological Institute of the Americas is offering bilingual technical and professional training in information technology, multimedia studies, mechatronics, systems engineering, contact centres and BPO.

Huge efforts have been made in Guatemala to improve occupational training. Education funds have been set up with public- and private-sector financing, and grants have been established for the industries targeted by the country's investment policy. In 2007, several companies announced investments in the sector.

In Costa Rica, exported services have been among the country's main investment recipients. Seven of the ten largest investment projects announced in 2007 were in this sector.

Honduras and Nicaragua have been advertising their attractiveness as a destination for investment in the sector by offering low-price utility services and skilled labour. Honduras' national competitiveness programme *Honduras compite*, together with private-sector initiatives, has helped train a large number of professionals. In Nicaragua, a database of available bilingual professionals was created in 2004. The country boasts modern and low-cost telecommunications infrastructure, the advantages of offering a neutral Spanish accent, and tax incentives among its attractions.

In Panama, the services sector is almost entirely oriented towards the provision of financial and logistics services for operations related to the Panama Canal, but ICT-enabled services have begun to receive attention in the country's investment policies. Panama has also attracted investment in high-tech Internet data centres and is seeking to improve its competitiveness in other services, such as contact centres, information storage, and the development of bioinformatics applications and mobile telephone content.

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of PROESA, El Salvador; the Costa Rican Coalition for Development Initiatives (CINDE); Invest in Guatemala; the Multilateral Investment Guarantee Agency (MIGA)/Commonwealth Secretariat; *Snapshot Caribbean. Benchmarking FDI Competitiveness in Caribbean Countries*, Washington, D.C., World Bank, June 2007; IBM Global Business Services, *Global Annual Location Trends. Annual Report*, October 2007; Dominican Republic Centre for Export and Investment, "República Dominicana: alcanzando el futuro", 2006 and "The Dominican Republic"; ProNicaragua [online] www.pronicaragua.org; Invertir en Honduras [online] http://www.hondurasinfo.hn/inversion/default_es.asp; Ministry of Commerce and Industry of Panama [online] http://www.mici.gob.pa/inversion.php.

4. "Other" services in Costa Rica and Mexico[55]

The "other" services[56] segment in countries such as Costa Rica and Mexico (consisting for the most part of business services) shows very different development patterns, even though these countries have in common mid-level- or high-tech manufacturing industries operating under free zone, maquila or temporary admission schemes. On the one hand, business services in the free zones of Costa Rica have grown steadily since 1988 to become the country's main employer (accounting for 22% of total employment in 2005). Average salaries in the exported services segment are the highest in the export sector as a whole, and the workforce includes many highly adaptable young bilingual technicians and professionals. Companies providing financial services, IT and related services, and back office services generated the most jobs in absolute terms and in terms of growth.

On the other hand, although Mexico is the second largest exporter of "other" services in Latin America after Brazil, it is important to note that its share in exports of these services in the region overall declined from 24% in 1985 to 12% in 2005, whereas Brazil's share increased from 15% to 38% in the same period (see figure V.6). Mexico's main market is still the United States, which absorbs three quarters of the its "other" services exports. In 2005, 41% of Mexico's exports of "other" services to the United States were bought locally from a foreign firm established there, i.e., as part of the international trade in services between multinational corporations and their subsidiaries. The "other" services that Mexico exports to the United States include telecommunications services, professional services, business and technical services, and education services. United States firms are also showing renewed interest in setting up shared service centres, especially in the finance and accounting fields (AT Kearney, 2007).

[55] See the complete investigation into business services in these two countries in ECLAC (2007e).
[56] Equivalent to total services minus transport and travel.

Costa Rica and Mexico have used different routes to penetrate the international business services market. Costa Rica took advantage of Procter & Gamble's presence in the country, as well as its efficient ICT services, the duty free zone, the language skills of the workforce, the existence of an export promotion agency and the socio-economic stability the country enjoys. Mexico, on the other hand, remains relatively important as a services outsourcing market, at least for certain sectors associated with mid-level- and high-tech maquila, owing mainly to cultural and geographical proximity to the United States and to its ability to meet companies' demands for relatively skilled labour. The growth of the informatics and ICT services sector, for example, has been made possible by the availability of 500,000 IT professionals in the country, the presence of over 1,000 universities and the fact that about 65,000 graduates from universities and technology institutes join the workforce each year.

In order to continue to exploit and sustain the positive factors that make them recipients of substantial volumes of FDI in services, Costa Rica and Mexico will have to build a pool of skilled human capital that can attract investments in more complex activities, i.e., effectiveness-seeking investment rather than just efficiency- (low-cost-) seeking investment. The demand for skilled workers in the IT programs development sector in Costa Rica outstrips supply. This could put off companies that are considering providing value added services that require workers with high skills levels. Mexico faces the challenge of maintaining and upgrading the skills of its workforce in order to fend off competition from countries like India and China, which easily surpass Latin American countries in offering low-cost skilled labour.

The institutional frameworks in both countries should make it possible, however, to successfully further national initiatives to promote service exports. The multitude of trade agreements in the region, for example, contemplate specific provisions on services and include agreements on the reciprocal promotion and protection of investments and on double taxation. Regulations to protect FDI are as important as regulations to protect intellectual property rights. This is particularly the case in high-tech sectors in which data are received, generated and transferred and in knowledge- and technology-generating sectors (associated with R&D). If regulations are too loose, companies will be reluctant to offshore or outsource the core businesses of their production process.

5. Clinical research services

Since 1997, there has been an increase in the outsourcing of clinical research in the pharmaceutical industry, which has traditionally invested heavily in R&D.[57] A significant portion of this type of research consists of medical trials, which can be conducted by the company itself or outsourced. In the case of the latter, a contract research organization (CRO) is contracted to carry out the trial. CROs perform the whole range of clinical testing activities, from phase I trials (first testing on human subjects) to phase IV trials (marketing of the tested product). One of the advantages of contracting a CRO, as far as pharmaceutical laboratories are concerned, is that CROs offer better access to patients and volunteers through the close contact these organizations have with doctors and researchers working at public and private hospitals (López, Ramos and Torre, 2008).

At the moment, Latin American countries are only marginally involved in international clinical R&D. Their share in the world market amounted to only 0.4% in 2005 (PhRMA, 2007), less than their share in the pharmaceutical industry's world sales (2.4%). The ratio between R&D and sales in Latin America is only 3.1%, compared with 18.6% in the United States (and is lower than anywhere else except Africa and the Middle East). The countries most involved in clinical trials in

57 The number of clinical trials performed simultaneously in different centres around the world increased notably after 1997, the year in which the International Conference on Harmonisation of Technical Requirements for Registration of Pharmaceuticals for Human Use, comprising the United States, Japan and the European Union, regulated the so-called "good clinical practices".

the region are Mexico, Brazil, Argentina, Peru and Chile.[58] In terms of trials per 100,000 inhabitants, the regional leader in this market is Panama, followed by Chile, Mexico, Costa Rica, Argentina and Peru.

Latin American countries supply patients who have not participated in clinical trials previously, which are the most critical asset in certain links in the clinical research value chain. The region is mostly involved in the discovery phases that require less knowledge and that have limited possibilities of producing technological spillover for local research. The doctors participating in the trials may learn about the technological innovations in the field, but do not necessarily “absorb" the knowledge incorporated into those technologies. Nevertheless, participating in clinical trials does encourage the mastery of better techniques for monitoring patient histories and organizing such trials (López, Ramos and Torre, 2008).

Given the current mode of participation in the clinical trials sector, the pharmaceutical industry seems unlikely to increase technological upgrading in the region. The links between local industry (which hardly conducts any clinical research) and foreign laboratories and CROs are just too tenuous. Local laboratories are also unlikely to benefit from any knowledge spillover in human resources because of the high staff turnover among companies and sectors in the region. The only prospects for moving up the global value chain in this sector are if the local pharmaceutical industry starts performing its own clinical research.

6. Advertising and audiovisual productions

In the past two decades, the international advertising sector has been transformed in two ways: activity has been concentrated in the hands of the world’s large multinational media groups, and the number of companies performing increasingly specialized tasks has risen.[59] There has also been a growing tendency to outsource certain stages of production for publicity items.[60] The increased segmentation of the industry has meant that advertisements can be conceived, produced, filmed and distributed in different countries, and this has led to the emergence of a true value chain in the sector. Often the large multinational companies buy out local advertising agencies that have skilled human resources. The savings in production costs for a piece of graphic advertising generated by this type of offshoring, for example, can triple profit margins for the company (Quickstart Global, 2007).[61]

The Latin American advertising market is a tiny percentage of the world one (5% in 2007, according to the estimates of Zenith Optimedia). Argentina and Brazil are the region’s main advertising exporters and stand out at the global level for both the quality of their productions and their creative talent.[62] The trends under way in Argentina and Brazil in the export of advertising services (which include design and creation activities, as well as audiovisual productions) are completely different from one another (see figure V.7). Advertising exports in Brazil during the past decade have been completely erratic, while Argentina has witnessed a spectacular boom in this sector, from selling next to nothing in 1997 to exporting volumes that surpassed Brazil’s in 2006.

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58 Argentina is an exception to this relatively pessimistic outlook given that its share in medical trials is higher than its share of world sales (PhRMA, 2007).

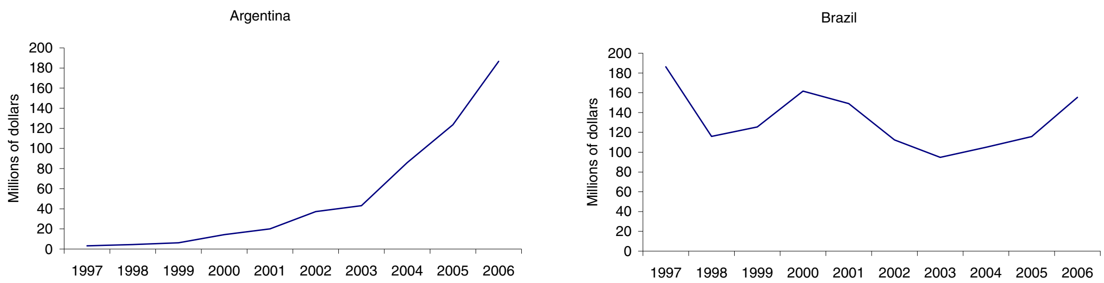
59 Given that advertising is an auxiliary service for other production activities, changes in the corresponding goods or services markets in which advertising plays a significant role in enhancing competitiveness have a considerable influence on the advertising business.

60 In the case of graphic advertising, for example, the large multinational media enterprises, such as WPP, Havas, Omnicom, Interpublic and Publicis, currently produce many advertising items in low-cost countries such as India, where highly skilled labour can be hired for low wages.

61 Not all activities are suitable for offshoring, however: strategic planning and client relations have to be kept in-house. The same applies in general to creative activities, inasmuch as knowledge of the idiosyncrasies of the target country for a specific piece of advertising and other sociocultural factors are of the utmost importance.

62 According to the Gunn Report 2007 on the quality of creativity, which is based on the winner’s lists from all major advertising award contests around the world, Argentina ranks third in terms of creative talent in the world (surpassed only by the United States and the United Kingdom) and Brazil fourth (ahead of France, Spain, Japan and Germany, among others). Mexico and Chile rank sixteenth and eighteenth, respectively.

Figure V.7
ADVERTISING SERVICE EXPORTS, ARGENTINA AND BRAZIL, 1997-2006



Source: For Argentina: Ministry of Economy and Production (MECON), Division of International Accounts; for Brazil: Central Bank of Brazil.

The advertising sector expanded in Argentina when the media were deregulated in the 1990s. The number of production companies working in advertising and in television and cinema mushroomed. Strong ties with the world's large media holdings and the abundant supply of skilled human capital were also key factors in the sector's success. In addition to relatively low costs, the country is able to offer a wide variety of locations and actors, which makes it possible to reproduce landscapes and scenes from all over the world. Together with the fact that summer in Argentina coincides with winter in the Northern Hemisphere and vice versa, this means that commercials can be shot off season too (López, Ramos and Torre, 2008).

Although the advertising sector does not seem to produce large spillovers of technology and knowledge, the presence of a robust export sector in advertising design can improve a country's image abroad by propagating the impression that it has a huge pool of creative talent. This could promote other activities in which creative capacity is a relevant determinant of competitiveness.[63] Given the peculiar features of this sector, public policies need to focus not only on generating favourable conditions, but also on ensuring the permanence of the right kind of services so that variations in costs do not necessarily make the country less attractive as a location in which to carry out audiovisual production activities.

7. Tourism[64]

The analysis of tourism in the region focuses on the countries of the Caribbean and Central America and Mexico. Tourism is of huge importance to the economies of these countries and some of them have been able to use it to attain sustainable levels of development. Several Caribbean countries, Mexico and Costa Rica, for example, have added value by moving on from the mass tourism of resorts and cruises to develop niche tourism (such as Carnival activities, sporting events and luxury hotels) and attracting FDI from international hotel groups, resorts and chains.[65]

The Caribbean countries and Central America gained ground, while Mexico lost ground in the world tourism trade between 1980 and 2005. The Caribbean's share of the market rose from 1.7% to 2.3% and Central America's from 0.2% to 0.7%. Mexico's fell from 3.3% to 1.8%. The Dominican Republic, Puerto Rico, the Bahamas, Cuba and Jamaica all increased their share in the

63 Although there is little vertical integration in this sector, it does provide services for a large number of other activities. Developing countries only benefit from the interaction between agencies and their clients if the latter manage to gain a leading position as an exporter in activities in which advertising is a vital ingredient for market competitiveness (which are more the exception than the rule).

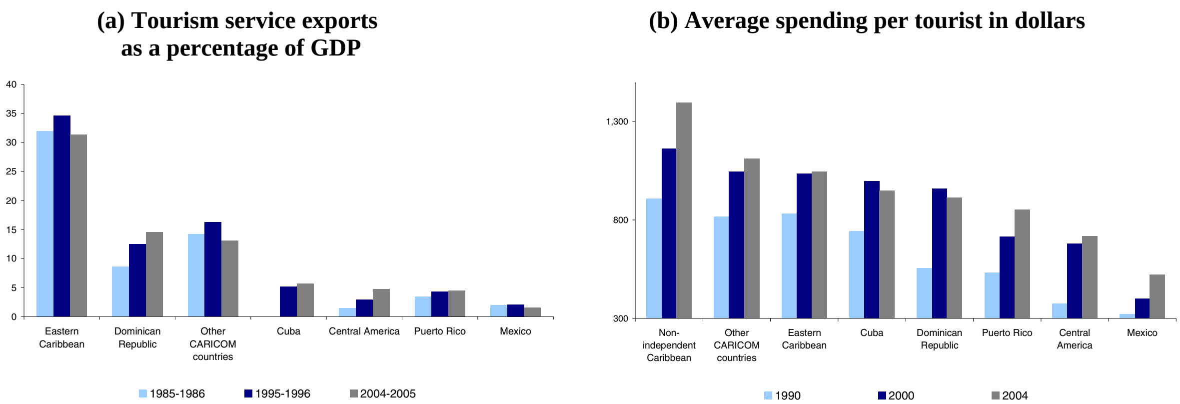
64 Part of the analysis of tourism is based on Bolaky (2007).

65 Several Caribbean islands have managed to diversify their tourism supply. Developments include: diving products and services and related marketing activities in the eastern Caribbean; surfing products and services in the Netherlands Antilles; and high-end tourism, including luxury mansions and boutique hotels, in Anguilla, the British Virgin Islands and Saint Vincent and the Grenadines.

Caribbean tourism sector, and Costa Rica increased its share in Central America, as did Guatemala, thanks to the efforts to raise the profile of its cultural heritage.

One way to measure the relative importance of the tourism sector in a country's economy is to compare total income from tourism with GDP (see figure V.8). The resulting ratios show that tourism is undoubtedly of considerable importance in the eastern Caribbean islands (where the ratio is over 30%), while of little weight in Mexico (barely 2%). Contrasting trends have emerged in the sector, however: in the eastern Caribbean States and other Caribbean Community (CARICOM) countries, income from tourism remained constant in relative terms, but increased notably in the Dominican Republic and Central America. Cuba and Puerto Rico also recorded modest increases in income from tourism. In Mexico, on the other hand, income from tourism, as a proportion of GDP, fell over time.

Figure V.8
TOURISM SERVICE EXPORTS AND SPENDING PER TOURIST, 1985 TO 2005



Source: Economic Commission for Latin America and the Caribbean (ECLAC) based on official information provided by the World Trade Organization (WTO), the World Tourism Organization (WTO) and the World Bank.

Note: The groups are as follows: Non-independent Caribbean: Anguilla, Aruba, Curaçao, Guadeloupe, Cayman Islands, British Virgin Islands, United States Virgin Islands, Martinique; Eastern Caribbean: Antigua and Barbuda, Dominica, Grenada, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines. Other CARICOM countries: Bahamas, Barbados, Haiti, Jamaica, and Trinidad and Tobago.

The impact of tourism on the local economy not only depends on how much it contributes to GDP (the direct effect), but also on its links with other sectors. The higher the average spending per tourist, the more important these links will be. Spending rates have reached their highest in the non-independent Caribbean and other CARICOM countries that have successfully managed to expand luxury tourism. Puerto Rico and Central America have also managed to increase the average amount tourists spend. Tourist spending rates fell in Cuba and the Dominican Republic between 2000 and 2004, which could signal the exhaustion of the mass tourism model, which is based on low prices. The low average spending per tourist in Mexico is explained by the large number of cross-border visitors rather than long-stay tourists that the country receives.[66]

Three concepts can be used to obtain a more precise picture of the effects of tourism on a local economy: linkages, leakages and multipliers (Meyer, 2006). Linkages refer to the capacity of the tourism sector to generate local economic development, in part through the purchase of intermediate inputs from other companies in the country that operate in the same sector or other

[66] According to the Bank of Mexico's figures, US$ 12.901 billion of foreign exchange income was generated by tourism in 2007 thanks to an increase in average spending per tourist, which represents a 6% increase on the previous year. Cross-border visitors (those who remain in the border area), however, spent on average US$ 74 per visit, while long-stay visitors (who travel to various cities and destinations) spent on average US$ 751 each per visit.

sectors (backward linkages). Some of these linkages weaken when there are leakages. Leakages are the term used to describe the proportion of tourist spending that "leaves" or "escapes" the country as imports and due to the involvement of intermediaries outside the country. In tourism development and economic development in general, the goal is to increase linkages by substituting imports with national products and services and to reduce leakages. Multipliers summarize the capacity of tourism to generate economic development through the repercussions of additional spending by tourists on income levels and employment. This capacity depends on the forward linkages of tourism (as a supplier for other sectors) and its backward linkages (as a purchaser of goods and services from other sectors) and its effects (induced spending) on households that are economically dependent on the sector.

According to a recent study on the Caribbean, multipliers in the subregion range from 0.72 in Grenada to 1.39 in Saint Kitts and Nevis (see table V.20). Different econometric studies (Ramjee Singh, 2006 and 2007; Lejarraja and Walkenhorst, 2007) show that a high or low multiplier reflects the importance of leakages and other factors, such as the size of the country, the diversification of the local economy, the standard of living in the country and the quality of tourism operators, as outlined below:

Table V.20
SELECTED CARIBBEAN COUNTRIES: MULTIPLIERS, LEAKAGES AND SOME DETERMINING FACTORS [a]

Country	Multiplier	Leakage	Population (thousands)	Surface area (km^2)	Agricultural value added per capita (2004 dollars)	Tractors per 100 hectares, 2003	Industrial value added per capita (2004 dollars)	Human Development Index, 2005
Saint Kitts and Nevis	1.39	0.60	48	360	226	221	726	0.821
Dominican Republic	1.33	...	9 614	48 380	231	17	306	0.779
Trinidad and Tobago	1.32	0.22	1 309	5 130	96	360	625	0.814
Barbados	1.27	0.66	270	430	304	366	587	0.892
Antigua and Barbuda	1.18	0.56	84	440	309	300	179	0.815
Dominica	1.18	0.45	72	750	593	180	257	0.798
Saint Lucia	1.15	0.62	166	610	211	365	210	0.795
Jamaica	1.10	0.50	2 664	10 830	171	177	424	0.736
Belize	1.01	n d	297	22 810	531	180	292	0.778
Bahamas	0.89	0.85	327	10 010	…	171	…	0.845
Grenada	0.72	0.55	108	340	285	120	185	0.777

Source: For multipliers and leakages: D.H. Ramjee Singh, "Small Island Developing States (SIDS), Tourism and Economic Development", 2007, unpublished, and "Import content of tourism: explaining differences among island States", *Tourism Analysis*, vol. 11, No. 1; for population, surface area, agricultural and industrial value added: the World Bank, World Development Indicators [online database]; and for the Human Development Index: United Nations Development Programme (UNDP).

[a] The countries are ordered by the size of their multipler.

(i) The size of the country in terms of population and surface area: the larger the country, the larger the multiplier. This hypothesis is proven to be true in the Caribbean, especially when a comparison is made between the Dominican Republic and Trinidad and Tobago, which have over one million inhabitants, and the other countries, which have populations of less than 330,000. Jamaica is the one exception because although its population is relatively large, its multiplier is quite small.

(ii) Local agricultural and industrial development: the larger the agricultural and industrial supply base, the greater the probability of linkages with tourism. It seems that industrial development, as measured by industrial value added per capita, is an important factor, as is local production in various countries that have high multipliers. Trinidad and Tobago, for example, has successfully developed local industry and produces competitive inputs for the tourism sector. As for farming, Lejarraja and Walkenhorst (2007) show that in order to supply food and beverages to the tourism sector, investments need to be made in agricultural technology. Using the number of tractors per 100 hectares as a measuring stick, it is clear that the countries that have attained the highest levels of technological development also tend to have more linkages and higher multipliers, with the exception of the Dominican Republic (because of its relatively large size in the subregion). Barbados is an interesting case in this respect. This island managed to transform its sugar-cane-based agriculture into a diversified, high-tech production sector and to become an important tourism inputs supplier. One notable feature of the Bahamas is the minimal development of local agriculture and industry. The country depends almost entirely on imports. Hence its low multiplier.

(iii) Standard of living: although the standard of living in the Caribbean is intermediate in most, and high in some, islands, the tourists who visit them come mainly from OECD countries and are more than likely willing to consume local goods and services. Standard of living is measured using the human development index (HDI), which reflects not only per capita income but also the quality of health care and education. The table shows that the higher a country's HDI, the higher its multiplier.

(iv) Type of tourism: linkages are better when tourism operators are local rather than foreign hotel chains. The high multiplier of Saint Kitts and Nevis is the result of the widespread use of bed & breakfast accommodations on the island, which has a high impact on the local economy.

Caribbean tourism seems to have considerable development potential, but in order to tap that potential, the public and private sectors will have to work together. The two main challenges consist of forging links with the local economy and reinventing and transforming tourism on an ongoing basis so that it can continue to grow. The countries of the Caribbean need to constantly explore new tourism niches, which represents a challenge to some of the islands in the subregion. Cultural and sporting events, luxury yachting, agro- and eco-tourism and educational trips can be used to diversify and expand the tourism supply base. A more diverse supply will encourage visitors to prolong their stay and spend more locally.[67]

Several studies also suggest that the possibilities for increasing linkages between tourism and the local economy are huge (Bolaky, 2007; Lejarraja and Walkenhorst, 2007; Meyer, 2006). On the basis of the preceding analysis, authorities should concentrate on certain key areas. One of these is the development of a competitive local agricultural sector that can produce goods that meet high quality standards. Hotels and resorts would then purchase more food and beverages locally rather than importing them. This is essential in countries such as the Dominican Republic, where the tourism sector mainly imports its inputs, and the local economy benefits only slightly from tourism activity. In order to reverse this situation, the Dominican Republic needs to overhaul its tourism model, as explained in box V.9.

[67] A detailed and compared study of tourism in the Caribbean that uses an approach based on leakages, linkage and multipliers can be found in Bolaky (2007).

Finally, greater integration of the industry can only be achieved within a favourable business climate. This means promoting intensive ICT use in the business sector, erecting a legal framework that encourages the incorporation of companies and the creation of formal jobs, and ensuring that there are public institutions and policies to support the development of first-rate local products and services.

Box V.9

TOURISM IN THE DOMINICAN REPUBLIC

The Dominican Republic has been one of the most impressive examples of tourism development in the Caribbean in the past two decades. In addition to being one of the fastest growing branches of the economy, tourism has become one of the most important sectors in terms of foreign exchange generation, job creation and infrastructure development. Tourism has also contributed to the geographical decentralization of the economy and stimulated a set of complementary activities, including farming, handicrafts and various types of services. Foreign investment and a set of government incentives ensured the sector's rapid development.

Only one model of tourism has been developed in the Dominican Republic, however, and this model is beginning to show signs of exhaustion. The boom has revolved around the construction of medium-sized and large beach resorts. Between 1980 and 2006, the number of rooms increased almost twelve-fold, from 5,300 to 63,000. The hotels are run by large tourism operators that also contract the charter flights that bring the tourists in. Many hotels offer all-inclusive plans and are to a great extent isolated from local communities. Because of the "sun, sand and sea" approach, tourism activity is largely concentrated along the coast. After a period of rapid growth between 1980 and 1997, several indicators showed that tourism was starting to decline: the number of visitors, the average length of stay, the amount of foreign exchange generated and the hotel occupancy rate all fell. The decline started before 11 September 2001, although the events of that day hastened it. Other contributing factors included the lack of development plans for communities living near tourism areas, the environmental degradation of beauty spots, rising crime rates, a shortage of cultural attractions, and increasingly fierce price wars. The lack of linkages with the rest of the economy constituted another limitation. The level of the country's multiplier (1.33) means that indirectly generated income corresponds to 133% of income that is directly generated by tourism, which is rather low considering the relatively large size of the island and reflects, at least in part, the inadequate quality of local goods and services. Also, as Freitag's study (1994) points out, resort tourism does not promote integration with the local economy, on the contrary, it seeks to limit interaction between tourists and the local community. Another factor that prevented tourism from having beneficial side effects in the rest of the economy is that the expansion of the sector was not accompanied by the development of the infrastructure needed to support its robust growth.

Tourism continues to pose an opportunity for development in the Dominican Republic, but the sector needs to be overhauled. The current model must be modified and diversified to prevent the sector's sagging returns and rising social and environmental tensions from worsening the sector's decline. The country has to shift from mass tourism to a model that generates more value per visitor without increasing the number of visitors. The public and private sectors need to work together to add attractiveness and uniqueness to the country's tourism supply. They should also move to increase and diversify the number of foreign operators and improve environmental management. There are numerous examples in the region of the successful development of new tourism niches that could serve as examples. In addition to improving linkages with the rest of the economy, efforts should be made to promote ties between local producers and tourism operators.

Source: United Nations Development Fund (UNDP), *Informe nacional de desarrollo humano. República Dominicana 2005*; J.M. Fanelli and R. Guzmán, "Diagnóstico de crecimiento para la República Dominicana", CEDES/Grupo Consultoría PARETO, 2007, unpublished.

8. The spread of technological capacity in the services sector

Regardless of the course of specialization chosen, countries have to create capacity in market segments in which competition depends less on costs and more on knowledge and acquired skills. Otherwise they will live under the constant threat of investors relocating and taking their export-oriented businesses with them whenever wage costs rise locally or fall elsewhere. Developing a knowledge- and skill-based capacity will also enable countries to move further up the value chains associated with the services provided in the region. Different cases from Argentina, Central America, Mexico, Brazil and the Caribbean will be presented as examples of different kinds of specialization and modes of insertion in value chains.

Amassing capacity to export services takes time, especially if the goal is to progress beyond activities that involve little complexity where the only requirement is the availability of cheap labour (e.g. call centres and SSCs). It means generating the complementary capacity to supply the inputs and capital goods associated with the services in question. The examples of relatively successful incursions into the service export sector in Latin America, of which there are few so far, underscore the importance of building such capacity and reveal how this is achieved over the course of a lengthy development process. This is the case of the engineering and construction services provided by Argentine and Brazilian firms, which apply the experience and knowledge they acquired through a long career of serving first the local market, then neighbouring countries and eventually markets outside the region.

The same applies to a large extent, although to younger companies, in the informatics services and programs sector. Exports from the sector have only become significant in some countries in recent years, although their experience in the field dates back several decades. In Argentina, for example, in the 1970s and 1980s, attempts were made to manufacture informatics products through projects that did not flourish as hoped, but did create the capacities and knowledge later applicable in informatics services. A similar situation arose in Brazil, although its informatics programs and services exports represent only a tiny proportion of sales in the sector.

The increase in clinical research activities in the region is also based on the presence of professionals and institutions of international repute in the field of biomedicine. Argentina's expanding advertising-related services exports are similarly the result of a long history of winning awards and distinctions in the field. The Argentine subsidiary of IBM has been able to make notable strides in exporting technical support and maintenance services thanks to its personnel’s extensive experience of technological platforms that have been discontinued or that are unknown to its other subsidiaries in the region.

The countries of Latin America and the Caribbean will not spontaneously become rising stars in the world services export market, however. In addition to detecting areas in which they have relatively advanced capacities that could be successfully exploited in international markets, countries need to generate competencies in new fields. A first step in the right direction is to include capacity-building on the agenda of both the public and the private sector in the region.

The generation and dissemination of capacities is crucial for strengthening a country’s position in the world market in the few areas in which that position is, at least to a certain extent, acknowledged. The region’s countries also face the possibility of promoting the export of services related to activities in which they already have a clear competitive edge, e.g., agro-industry in Argentina, petroleum in the Bolivarian Republic of Venezuela and Mexico, and mining in Chile. The list obviously does not need to be limited to natural-resource-intensive sectors. It could be extended to include a variety of “traditional” manufacturing or service activities, such as those examined in this section, in which the region’s countries have internationally acclaimed levels of knowledge and competence.

Obviously the risks involved are higher than in strategies based on existing static comparative advantages. The region’s countries, especially the larger ones, will probably not have much choice but to pursue this option, however, if they are to tap the potential of the world services market to generate foreign exchange and jobs, as well as technology and knowledge spillovers. Though long-term, these strategies need to be designed right away: capacity-building in these sectors is measured in decades, not years.

E. Trajectories and learning opportunities in value chains

The production and services structure in the region is closely integrated into the world economy, as shown in previous sections. The overhaul of the manufacturing industry inherited from the days of import-substitution has enabled countries to preserve certain important competitive advantages in the local market and to successfully position themselves in global markets. Thanks to appropriate public policies and the ability to adapt and improve technological learning, some sectors, such as chemicals, motor vehicles, metallurgy, aerospace and nuclear energy, have managed to remain competitive in international markets. Technological advances in the export-oriented manufacturing industry, especially the maquila sector, were largely brought about by the strategy implemented by multinational companies with regard to the value chains and production activities associated with global production chains. In the textiles and clothing sector, for example, several companies shifted production to offer “full packages” or created their own trademark. There are also clear signs of the spread and generation of technological capacity in the electronics and automotive sectors, inasmuch as some plants have introduced R&D activities to support product and process design.

Given the natural advantages that Latin America and the Caribbean enjoy, the technology learning process in the agro-industry sector depends on the adoption and spread of biotechnology. The companies currently working in life sciences and animal genetics, together with the potential to adapt the organization of soybean and maize production in the region represent a starting point for the creation and propagation of technological skills. The growing global demand for minerals also offers opportunities for the adoption of ICTs and biotechnology and for strengthening integration with other production and service activities at the local level. The strides in technology learning in the industrial sector are being made parallel to the modernization of the services sector. Trade in services has been flourishing, and, in recent years, there has been growing demand for skilled labour and a stronger insertion in global value chains.

Most production activities form part of the organization of global value chains and depend on them. The different government schemes outlined in chapter I determine profit levels, the possibilities of entering the market and the upgrading that characterize production today. The management systems of the sectors analysed in the previous sections (agro-industry, mining, automotive and autoparts, textiles and clothing, electronics and services) are summed up and classified below.

As the history of the Asian tigers shows, the possibilities of entering and advancing in value chains depends on the technological capacities that countries manage to develop in different production sectors. Learning processes (as pointed out in chapter I), therefore, play a pivotal role,[68] but those heading the chains are not always willing to transfer the necessary knowledge to allow local companies to upgrade and thus gain access to new sources of profits (Altenburg, 2006). Four types of upgrading were identified in the sectors under consideration: Process upgrading (through the reorganization of the production process or the introduction of improved technology), products upgrading (the development of higher unit values), functions upgrading (changing existing functions for those that require greater technological and management capacity) and intersectoral upgrading (taking advantage of the capacities acquired in one value chain to apply them in another). Each type of upgrading can be derived from external or internal sources of innovation, or a combination of both.[69]

[68] See Hilbert, López and Vásquez (2008), Humphrey and Schmitz (2000), Morrison, Pietrobelli and Rabellotti (2006).

[69] External sources include innovations incorporated through inputs and is generated by the relationship with suppliers, purchasers, research centres and universities. Internal sources include learning economies and R&D.

Companies' learning patterns and the building of technological capacity depend on the structure of value chains and the schemes that govern them. The first step in determining the opportunities that the region's companies and sectors have for learning and upgrading is to identify leaders and work out how the value chains are controlled. This will vary according to the sector in question. The structure in the manufacturing export industry (textiles and clothing, motor vehicles and electronics), which is dominated by multinational companies, is quasi hierarchical if not totally hierarchical (see table V.21), while market forces and a quasi hierarchical structure interplay in the agro-industry and mining sectors (see table V.22), and the structure in business services is rigidly hierarchical (see table V.23).

Table V.21

TEXTILE AND CLOTHING, AUTOMOTIVE AND ELECTRONICS INDUSTRIES: QUASI HIERARCHICAL AND HIERARCHICAL STRUCTURES

Value chain	System governing the value chain	Opportunities for learning and upgrading
Textiles and clothing (Central America, Mexico and the Dominican Republic)	**Leader(s)**: buyer-driven foreign companies with their own brands and "manufacturers without factories" (Wal-Mart) **Source of power**: product design, new technologies and trademarks. Market power to set prices and influence the geographical distribution of manufacturing operations worldwide	**Upgrading** of processes and functions, upgrading to full-package production and own trademarks **Main sources of innovation** Innovation in inputs (the purchase of new machinery). Learning processes (adaptation, utilization and interaction) and capacity-building to meet clients' specifications
Automotive and autoparts (Mexico)	**Leader(s)**: Subsidiaries of transnational corporations Autoparts: components and spare parts producers with links to assembly line suppliers. Presence of systems integrators that have operations worldwide (Delphi) and small and medium-sized groups founded with national capital **Source of power**: business strategies defined by corporate decisions made at the worldwide level	**Upgrading** of processes and functions upgrading (the automotive and autoparts industries have been slowly converging in the areas of engineering and design) **Main sources of innovation** Capacity-building has been greater in production processes than in products due to the incorporation of lean just-in-time manufacturing techniques.
Electronics (Central America, Mexico and the Dominican Republic)	**Leader(s)**: four main types: transnational corporations, manufacturing contractors, leading suppliers and secondary suppliers **Source of power**: transnational corporations and manufacturing contractors coordinate their transactions and the exchange of knowledge within the network.	**Upgrading** of processes, functions upgrading and intersectoral upgrading (new machinery and equipment, modern organization techniques for production, design and R&D activities, convergence of the automotive, electronics and aerospace industries) **Main sources of innovation** Development of capacity to adapt, and even create, new machinery and equipment

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

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Table V.22
AGRO-INDUSTRY AND MINING: MARKET RELATIONS AND QUASI HIERARCHY

Value chain	System governing the value chain	Opportunities for learning and upgrading
Commodities (cereals, corn, soy and others)	**Leader(s)**: transnational corporations (suppliers of biotechnology inputs); international traders **Source of power**: Direct effects of the leader on upgrading through support mechanisms	**Upgrading** of processes and products, and intersectoral upgrading **Main external sources of innovation** Importation of advanced (bio)technological products adapted to local needs **Main internal sources of innovation** Learning processes (adaptation, utilization and interaction). Human resources training in biotechnology. Adaptive R&D to improve and control quality, origin, marketing and transport networks
Preserved industrialized products (beverages and other products)	**Leader(s)**: supermarkets **Source of power**: Direct effects of the leader on upgrading processes through the definition of quality standards	
Fresh products (fruit, vegetables, meat and other products)	**Leader(s)**: supermarkets **Source of power**: Direct effects of the leader on upgrading processes through the definition of quality standards and rules of origin	
Copper, iron and silver (Argentina, Brazil, Chile, Peru and Mexico)	**Leader(s)**: Transnational corporations, State-owned enterprises and national companies with a strong market presence **Source of power**: vertical integration of the production process	**Upgrading**: limited space for local participation and upgrading **Main external sources of innovation** Technological adaptations related to the geographical features of mining deposits; Public-private alliances for performing R&D **Main internal sources of innovation** Learning processes (adaptation, utilization and interaction)

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

Table V.23
SERVICES: HIERARCHY

Value chain	System governing the global value chain	Opportunities for learning and upgrading
Business services (Chile, Argentina, Brazil, Costa Rica, Mexico) Shared Service Centres (SSCs), business services, clinical research services, advertising and audiovisual services	**Leader(s)**: global outsourcing, by transnational corporations (in the case of SSCs), clinical and contract research organizations (CRO) and large international conglomerates **Source of power**: Close ties between SSCs and headquarters, constant revision and monitoring of the tasks performed. In clinical research, Latin America participates in the less knowledge-intensive stages of the value chain	**Upgrading** of processes and functional and intersectoral upgrading **Main sources of innovation** Access to technological novelties in clinical research, with limited spillover into local innovation due to the shortage of capacity to absorb the knowledge contained in the technology, pool of human resources skilled in advertising and audiovisual production
Tourism (Caribbean, Central America and Mexico)	**Leader(s)**: Transnational (trademark) companies, worldwide operators of mass tourism **Source of power**: Wealth of natural, environmental and cultural resources	**Upgrading** of products towards new tourism niches **Main sources of innovation** Local development, intra- and intersectoral forward or backward linkages and multiplier effects

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

International buyers head or dominate the value chains of global production structure in the textiles and clothing sector (see table V.21). In general, foreign companies control the product design, determine how production processes are organized and own the trademarks. These activities are carried out mainly in the developed countries and in some Asian countries that have mastered and effectively adapted the new technologies, the “manufacturers without factories” mentioned in chapter I. In Mexico, Central America and the Caribbean, textiles and clothing manufacturers are usually national SMEs that operate under maquila, temporary admission, free zone or assets-upgrading schemes. The technological learning takes place through the purchase of new machinery and the modification of production organization techniques which enable local firms to upgrade to activities that incorporate more technology at the local level. This has been the process for the companies that have achieved greater vertical integration by switching to full-package production and upgraded towards new functions, such as design, marketing and the manufacturing of their own brands (Padilla-Pérez and others, 2008).

The reigning scheme or modality in the automotive, aeronautical, electronics and semiconductors industry in Mexico is hierarchical in nature, as it is in other capital- and technology-intensive sectors. Transnational corporations are firmly established in the more concentrated and profitable segments of the corresponding global value chains. They own the renowned trademarks, make it almost impossible for any other company to penetrate the market and control the chain both forwards (distributors and retailers) and backwards (suppliers of raw material and components). [70]

The value chains of the automotive and autoparts industry in Mexico depend on the business strategies defined by corporate decisions that are made from a worldwide perspective with a view to maximizing the advantages of location, economies of scale, the use of installed capacity and low costs (see table V.21). The specialization of the industry in Mexico in the production of light vehicles and trucks is partially the result of the decision of car assembly companies to transfer their production platform to Mexico so as to be in a position to meet United States demand faster. Through the incorporation of light manufacturing and just-in-time techniques, greater capacities have been created in production processes at the local level. Upgrading in this area is particularly difficult because R&D activities are a key element of the competition among multinational companies. In some cases, however, the automotive and autoparts industry has tended to converge slowly but surely in certain areas of engineering and design and managed to upgrade some functions.

The electronics industry is a paradigm inasmuch as many companies in this sector have ceded a large portion of their manufacturing processes and the partial management of the value chain to specialized enterprises (Sturgeon, 2002). The automotive industry has also evolved toward a model whereby assembly companies subcontract the supply of complete vehicle modules and systems to their top-grade suppliers which assume responsibility for the design and production (Salerno, 2000).[71] In both cases, the result has been the emergence of global suppliers that are capable of providing parts and components to large buyers anywhere in the world (Humphrey and Schmitz, 2004).

The electronics industry poses opportunities for upgrading in process technologies thanks to the global changes underway, such as the introduction of automated machinery and equipment and the diffusion of modern production organization techniques (see table V.21). Although the barriers to upgrading in product technologies are higher, there has been a gradual increase in design activities and even in R&D. In Costa Rica and Mexico, there are possibilities for process, product,

70 For example, in the 1980s, the system used by the average Japanese motor vehicle manufacturer included 170 first-level, 4,700 second-level, and 31,600 third-level subcontractors. This model was later adopted by other companies in the sector (Gereffi, 2000).

71 The transition from parts to modules, and from modules to systems in the modern automotive industry has been remarkable. A motor vehicle has about 44 parts that are grouped into 12 modules, which in turn correspond to four systems: interior, body, electrics/electronics and chassis. Assembly companies thus changed from supplying parts to supplying modules, and, in several cases, to supplying systems, which has led to a huge reorganization of the industry (Sturgeon and Lester, 2002).

functions and intersectoral upgrading. In Mexico, these opportunities are already beginning to be tapped now that the convergence of learning processes in the automotive and electronics sectors has paved the way for the development of the aeronautical industry, which requires highly complex high-tech components (Padilla-Pérez and others, 2008).

Process upgrading will continue to form part of a worldwide trend in the electronics industry to reduce costs, shorten production cycles and incorporate new ICTs. Capacity to modify, and even create, new machinery and equipment has already been developed in the region (see section C). As the case of the electronics industry in Jalisco shows, in these circumstances, upgrading towards more technology-intensive and higher value added sectors requires suitable public policies and innovation systems that encourage investment in R&D activities in product design, the use of improved processes and a better positioning of local technology companies in world markets.

In agro-industry, multinational companies set themselves up at decisive points in the value chain and coordinate relations and technological exchanges along it (see table V.22). Multinationals and large international commodities traders are the main suppliers of biotechnology inputs. Upgrading therefore depends on public policies that facilitate the capacity to adapt biotechnological advances to local conditions, whether these be climactic or related to local and international markets. The local availability of complementary, technological, organizational and institutional assets is of fundamental importance. In fact, the increase in productivity recorded in past few years in some crops, such as soybean and maize, was brought about by the adaptation of highly advanced technological assets in combination with local efforts.

The adoption of biotechnology creates opportunities for learning and innovation, in regard to both processes and products. There is a marked tendency to increase the level of technological complexity of goods with a view to differentiating a product in key aspects for the consumer, such as origin and food safety. Essential services for marketing food products are also increasingly being incorporated into the value chain (logistics, packing, transportation and distribution). The idea is to pursue opportunities that have yet to be explored in the region and to develop forward linkages by integrating new related products and functions into the agrifood value chain. The cases of some products have shown that improvements in the organization of production and in process technologies can produce spectacular increases in crop yields. Any technological advances need to be sustainable over time, however, to prevent the overexploitation of natural resources and to meet the particular features of demand in developed countries.

There are also huge opportunities for generating farm inputs (machinery, seeds, agro-chemicals, technical assistance) by establishing links with industries that use cutting edge technology. Progressing towards the production of higher value added goods does not necessarily imply a high level of industrial processing or more vertical differentiation, but it does imply increased knowledge and innovation content not only in the raw materials for agriculture, but also in the later stages of the agrifood industry, especially in logistics and marketing.

There are three types of player in the mining sector in the region: subsidiaries of transnational corporations, State-owned enterprises and companies with high levels of national capital (see table V.22). The transnational corporations with a large global presence vertically integrate their production processes and concentrate their efforts on innovation. Despite the limited room for local participation and upgrading in this area (given that subsidiaries are rarely entrusted with R&D or likely to generate learning processes that facilitate the upgrading of local companies in the value chain) there are clear opportunities for both. Each project poses specific problems, technologies have to be adapted to the geological features of the deposits in question, innovative means of reducing costs have to be found (the deeper the mining operation becomes), and the impact on the environment has to be minimized. There are also opportunities for mining companies to cooperate with suppliers and the public sector on R&D in areas of common interest. Capacity-building increases through interaction in networks even though, for decades, capacity was only built within mining companies when these were vertically integrated enterprises.

Latin America’s participation in global value chains in the business services sector poses attractive prospects for increasing exports and creating skilled jobs. First the challenge of ensuring knowledge spillover and the accumulation of technological capacities (see table V.23) needs to be overcome. Upgrading can occur when the barriers are lowered for knowledge-based activities and these replace activities whose competitiveness is only “spurious” (cost-based).

In the clinical research sector, for example, Latin America participates only in the less knowledge-intensive stages of the chain, which opens up opportunities for upgrading towards data collection and compilation activities. These activities could stimulate greater interaction with the pharmaceutical industry and boost local capacities in the countries that already have a foothold in the sector. The prospects for upgrading in the advertising and audiovisual production services sector are also good thanks to the low costs and specific cultural attractions the region can offer.

In tourism, several countries in the Caribbean, Mexico and Costa Rica have been able to add value by moving on from serving the mass tourism market of resorts and cruises to offer selective tourism products (Carnival activities, sporting events, luxury hotels, and so forth). The process has been a slow one, however, and the multiplying effect of tourism is still low due to the lack of linkages with the local economy. A favourable climate that fosters the intensive use of ICTs needs to be created, regulations need to be implemented to promote the establishment of formal companies and jobs, and public institutions and policies need to support the upgrading in quality of local products and services.

Chapter VI

Public-private alliances for structural change, productivity growth and closer integration with the world economy

An analysis that takes in other regions of the world reveals that a number of countries (some with resource endowments similar to those of the region) have enjoyed sustained, long-term growth which has led to a convergence of their income levels with those of the world's richest economies, or at least a performance that is better than that of our region. This chapter will look at a number of countries that exhibit these traits.[1] Although they differ in many ways in terms of their history, culture, political system, structure and level of development and geographic locations, there is another element that most of them share, although it may differ in its specificity, content and levels of differentiation from one country to another: the authorities have applied a medium- or long-term development strategy, either nationally or on a more limited scale, which has increasingly been based on a vision that goes well beyond a concern with macroeconomic balances. These countries are working proactively to forge a forward-looking vision that can serve to guide a medium- and long-term structurally-based strategy with goals supported by incentives that directly promote integration with the world economy and foster structural change and productivity growth.

[1] Australia, Czech Republic, Finland, Ireland, Malaysia, New Zealand, Republic of Korea, Singapore, Spain and Sweden.

These strategies are generally not a creation of the central government alone, but instead arise out of public-private alliances involving elements of political leadership, civil society participation and consensus-building or, at the least, of public understanding. This phenomenon takes different forms from one country to another, as will be seen below. While the success of such a strategy hinges on its technical design and application, no less important is the existence of an appropriate institutional framework for its formulation and implementation. Such a framework, rather than emphasizing efficiency in all aspects, focuses on coherence and effectiveness in relation to established goals, the possibility of experimenting with incentives, flexibility, error correction and the strategy's ability to transcend the bounds of political cycles.

The aim is not to demonstrate a causal relationship between the strategies and their content, on the one hand, and, on the other, the outcomes in those countries in respect to structural change and economic growth. Instead, the aim is simply to report on the "what" and, most of all, on the "how" of the formulation and implementation of strategies and of the associated institutional structures in order to provide a basis upon which the countries of the region can evaluate the relevance of such experiences and their importance for national development.

It is not a question of trying to replicate such strategies, institutions or processes in the Latin American and Caribbean region. Clearly, there are too many cultural, political, economic and historical specificities for such a thing to be possible. Nonetheless, based on a more abstract view of institutional structures and the operational dimensions of these specific experiences —particularly in terms of their implementation, i.e., the "how"— generic "first principles" on organizational issues can be detected that reveal successes or difficulties.[2] In cases where a given characteristic is found to have a positive impact, approaches can be identified —although, in all cases, they must be adapted to local conditions— which can be used to improve the implementation of a national strategy. When a characteristic turns out to be negative, it reveals dimensions of a strategy which need to be changed or abandoned.

This chapter and the presentation of the 12 first principles are structured as follows.[3] The first section reviews the national development strategies of 10 selected countries in Asia, Europe and Oceania, together with four strategic orientations for strengthening integration with the world economy and export development[4] that have been instrumental in structural change and productivity growth: an area where all those countries have made significant, and in some cases spectacular, progress. The next section deals with public-private alliances, which interact as part of the formulation and implementation of government strategies. The following section presents an analysis of institutional issues relating to strategy formulation and implementation based on the experiences of selected countries. The final section explains why these principles may be significant for Latin America and the Caribbean.

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2 As pointed out by Prats i Català (2004), because institutions cannot be transplanted, exported or copied, there are specific limits to "good practices" in terms of institutional development. This document therefore refers to generic first principles.

3 This chapter is based on the study conducted by Devlin and Moguillansky (2008) as part of a project on public-private alliances for innovation and export development sponsored by ECLAC, the Ibero-American Secretariat General (SEGIB), and the Governments of Chile, through the Chilean Economic Development Agency (CORFO), and the Republic of Korea, through the Ministry of Foreign Affairs.

4 Export development has several dimensions, which can of course be combined. It can include exporting greater quantities of products that already have a share of the world market, and doing so with increased productivity. It can also involve improvements in the quality of export products which are already exported, to increase unit values in existing areas of production. Another dimension would be horizontal diversification based on existing comparative advantages, which are relatively easy to identify but for some reason are not fully exploited. Export development can take the form of increasing the value added of existing exports. Lastly, thanks to a deepening of the latter process or through a more independent process, it can mean the creation of truly new comparative advantages.

A. The nature of national strategies

1. Characterization of countries

Before fully entering into the analysis of strategies, what follows is a brief description of some general indicators to describe the countries studied in this chapter. Most of the countries are small economies, both in terms of population and size of territory (see table VI.1). The exceptions to this are the following four middle-sized countries with between 20 million and 50 million inhabitants: Australia, Malaysia, Republic of Korea and Spain. The table also shows that, in the last 25 years, the growth rate of almost all these countries has been higher than that of high-income OECD countries, which has resulted in convergence.[5]

Table VI.1
SELECTED COUNTRIES: GENERAL INDICATORS

	Size of territory	Population	Growth of per capita GDP (annual percentage), constant 2000 US$		Per capita GDP (constant 2000 US$)		Gross domestic savings (percentage of GDP)		Foreign direct investment (FDI) (percentage of GDP)	
	Thousands of Km ^{2}	Millions	1980-1989	1990-2005	1980	2006	1980-1989	1990-2005	1980-1989	1990-2005
Australia	7 682	20.61	1.9	2.0	14 195	23 372	25.1	22.7	1.7	1.9
Czech Republic	78	10.25		1.9	5 336	7 040		27.0		5.0
Finland	304	5.26	3.2	1.7	15 566	27 081	27.0	25.4	0.3	2.9
Ireland	68	4.13	2.7	5.3	9 955	31 410	18.8	34.6	0.6	7.0
Malaysia	330	26.1	3.2	3.8	1 848	4 623	30.2	42.1	3.2	4.4
New Zealand	270	4.17	1.1	1.8	10 622	15 458	23.2	22.9	3.0	3.9
Republic of Korea	99	48.3	6.4	4.9	3 221	13 865	30.9	34.5	0.3	0.8
Singapore	6.9	3.6	5.3	3.9	9 043	27 685	41.8	46.6	10.0	13.1
Spain	504	44.1	2.3	2.2	8 826	16 177	21.9	23.2	1.3	3.1
Sweden	449.9	9.1	2.0	1.7	19 330	31 197	21.7	22.9	0.4	4.5
High-income OECD countries [a]			2.3	1.7	17 556	29 748	21.7	21.2	0.6	1.8

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of World Bank, World Development Indicators [online database].

[a] Average of all OECD countries except Hungary, Mexico, Poland, Slovakia and Turkey.

Figures VI.1 and VI.2 compare per capita income with the average of high-income OECD countries. They show that countries implementing structural strategies (such as Finland, Ireland, Malaysia, Republic of Korea and Singapore, as discussed in the following section), have converged more effectively than countries with less structural strategies. Some of the latter, such as Australia and New Zealand, have undergone long periods of divergence.[6]

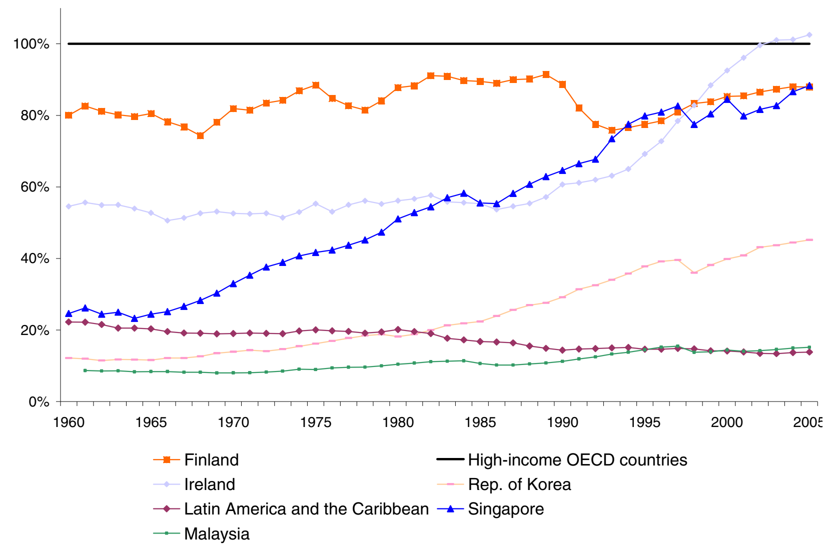
Table VI.1 also shows that all countries have high rates of saving in relation to GDP, with rates of above 40% in cases such as Malaysia and Singapore. The same table also demonstrates the

[5] Since the mid-twentieth century, the income of Sweden has been one of the highest of the countries of the Organisation for Economic Co-operation and Development (OECD).

[6] In some countries, joining the European Union (EU) coincided with a convergence process. In Finland, convergence was interrupted by the fall of the Soviet Union and picked up again from the time of latter's reforms in the mid-1990s, which also coincided with entry into European Union. The recovery of Spain also coincided with its entry into the EU. As for two countries that are not included in the figure, Sweden and the Czech Republic: the first experienced a long process of divergence that began to revert at around the same time as its entry into the European Union (1995), while the second showed signs of convergence as it prepared to join the EU (2004). Nonetheless, policies and strategies are important, as countries such as Greece and Austria did not achieve convergence along with EU entry.

importance of foreign direct investment (FDI) for some countries in terms of both structural change and export development (especially in the Czech Republic, Ireland, Malaysia and Singapore).

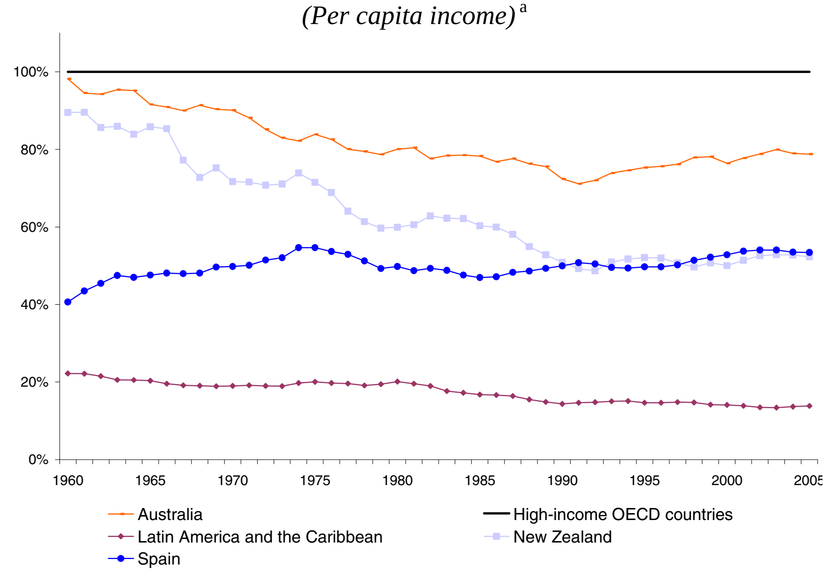
Figure VI.1
CONVERGENCE OF COUNTRIES WITH STRUCTURALLY-ORIENTED STRATEGIES, COMPARED WITH LATIN AMERICA AND THE CARIBBEAN
(Per capita income) [a]



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of figures provided by the World Bank.

[a] Average per capita income of high-income OECD countries = 100.

Figure VI.2
CONVERGENCE OF COUNTRIES WITH LESS STRUCTURALLY-ORIENTED STRATEGIES, COMPARED WITH LATIN AMERICA AND THE CARIBBEAN
(Per capita income) [a]



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of figures provided by the World Bank.

[a] Average per capita income of high-income OECD countries = 100.

In table VI.2, the final column shows the proportion of GDP accounted for by trade. Although this percentage differs considerably from country to country, it remains significant for all of them, with trade openness increasing over the past 15 years. This is consistent with the importance of export growth in all these countries, with rates that are mostly above those of the high-income OECD countries and that are more than twice as high as GDP growth rates. Within the export basket, there have been significant increases in medium- and high-technology products, except in countries endowed with abundant natural resources.[7]

Table VI.2
SELECTED COUNTRIES: TRADE INDICATORS [a]

Country	Total R&D expenditure (percentage of GDP)		Export growth (annual percentage), constant US$ 2000		Medium-technology exports (percentage of manufacturing exports) [b]		High-technology exports (percentage of manufacturing exports) [b]		Imports and exports (percentage of GDP)	
	1990-1999	2000-2005	1980-1989	1990-2005	1980-1989	1990-2005	1980-1989	1990-2005	1980-1989	1990-2005
Australia	1.6	1.6	5.1	5.0	6.5	11.0	2.7	6.4	32.0	39.2
Czech Republic	1.1	1.2		9.5		39.6		14.4		118.7
Finland	2.8	3.5	3.2	7.0	26.9	26.3	6.0	22.9	55.7	65.7
Ireland	1.3	1.2	8.3	11.2	15.4	12.2	24.2	40.8	106.0	150.8
Malaysia	0.3	0.6	9.2	10.0	9.3	16.9	19.4	45.9	112.0	197.8
New Zealand	1.1	1.2	3.6	5.1	6.2	9.9	2.2	4.3	57.5	60.5
Republic of Korea	2.4	2.5	11.5	13.2	30.7	36.4	14.7	31.9	67.3	68.7
Singapore	1.7	2.1			21.8	18.7	28.1	52.8	[c]	[c]
Spain	0.9	1.0	5.2	6.8	32.8	42.4	6.5	9.9	37.1	50.5
Sweden	3.6	4.0	4.1	6.4	40.9	35.9	13.1	21.4	64.4	75.6
High- income OECD countries	2.3	2.5	4.7	5.5					35.1	40.0

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of World Bank, World Development Indicators [online database].

[a] Year 2000 for European Union countries. Last index available for the other countries: Australia 1994, Republic of Korea and Singapore 1998, Malaysia and New Zealand 1997, Czech Republic 1990.
[b] The share of exports was calculated according to the classification put forward by Sanjaya Lall (2000), with information from the United Nations Commodity Trade Database (COMTRADE).
[c] The net figure for re-exports is not available.

Lastly, effort in terms of research and development (which is part of a strategic approach towards a knowledge economy in most of these countries) tends to be much higher than in Latin American countries (except in Malaysia and Spain), with a positive trend observed in recent years.

2. Strategies: stylized facts

First principle

A national strategic vision with a medium- and long-term structural focus that combines a proactive approach with ambitious yet realistic goals can be instrumental in structural change, export development and economic convergence.

This section provides information on the strategies applied by the selected countries, noting landmark events in terms of turning points or changes over time, as summarized in table VI.3 (for further details of the countries' specific experiences, see annex V.1). An analysis of these strategies shows that there are a number of common elements, as well as factors that differ or are specific to a given country. The stylized facts in this case are:

[7] What is not conveyed in table VI.2 is that New Zealand, but above all Australia, have increased the productivity and added value to goods and services (especially their natural resources).

Table VI.3
NATIONAL STRATEGIES: SELECTED LANDMARK EVENTS

	First period	Second period	Third period	Fourth period
Australia	1920 Import substitution	1983 Washington Consensus-type trade and political liberalization	2000 - Push forward in the area of innovation and FDI attraction	
Czech Republic	Up to 1989 Centrally planned industrialization	1990 Introduction of market mechanisms. Washington Consensus. Privatizations and emphasis on business development. FDI attraction. Institutional development and strengthening of competitiveness	2005 Incentives oriented towards high-technology goods and services. Boosting the development of micro-institutions. Promoting innovation, institutionalization and collaboration between industry and the academic world. Formulating a strategy for innovation and export development. More selective attraction of FDI	
Finland	1970 Industrialization based on natural-resource-intensive branches. Protectionism and subsidies for emerging industries. Continuing emphasis on education	1993 Joins the European Union. Liberalization of trade and external capital, together with increased attention to long-term microeconomic trends. Towards an innovation society. Strengthening and coordination of industry and the innovation system. R & D approach guided by the growth of industry	2006 - Strengthening the capacity for renewal of the innovation system. Increasing the knowledge base. Improving the quality and goals of scientific and technological research. Increase the marketing of innovation	
Ireland	1970 Change from import substitution and a protected economy to openness to foreign capital and trade related to European Union entry in 1973	1986 Programme for National Recovery adopted to promote social stability and cohesion. Industrial policy based on attracting export-oriented FDI	1993 Capacity-building for improvements in competitiveness, focusing on sectors or market niches, SMEs with export capacity and incentives for a more selective attraction of FDI, in addition to an aggressive basic infrastructure programme and a State modernization plan	2006 Entry into a knowledge-based society, emphasizing high-value-added activities. Vigorous programme of incentives for innovation and for the internationalization of local businesses, as well as strengthening networks for production, marketing and innovation

Table VI.3 (continued)

	First period	Second period	Third period	Fourth period
Malaysia	1960 Industrialization oriented towards import substitution	1970 New Economic Policy (1970-1980). Industrial policy based on attracting export-oriented FDI. Adding value to manufactured exports and initiating development of technology corridors	1980 Reorientation of the industrialization process towards import substitution once more (heavy industry). Developing targeted protection policies, direct State participation in the production process and the development of complementary industries	1986 Export promotion based on trade liberalization, active participation in free trade agreements and industrial development. 1986-1996: export revival based on FDI attraction, lower tariffs and managing the exchange rate to maintain competitiveness. 1996 onwards: developing the knowledge-based economy, guided by a long-term vision based on the development of international services, ICT, value added in export manufactures and technological innovation corridors
New Zealand	1960 Industrialization oriented towards import substitution	1984 Washington Consensus-type trade and political liberalization	2006 A 10-year economic transformation agenda focusing on globally competitive firms, world-class infrastructure, stimulating innovation and productivity, environmental sustainability and promotion of Auckland as a city able to compete on the world stage	
Republic of Korea	1964 Industrialization in low-technology goods with a focus on exports	1970 Industrialization based on dual-purpose military/ heavy industry and increased export values. Emphasis on technology imports	1981 Stabilization, liberalization. Development of the electronic sector. Move from creative imitation phase to innovation	2001- Knowledge-based economic development. Industrial policy emphasizing innovation. Internationalization of small and medium-sized firms

Table VI.3 (concluded)

	First period	Second period	Third period	Fourth period
Singapore	1965 Industrialization through import substitution Exports of light manufactures and FDI attraction	1979 Policy of orientation towards medium- and high-technology industry and services. Wage increases in labour-intensive sectors, to provide incentives for the achievement of the above goal	1990 Internationalization of manufacturing toward neighbouring countries, followed by expansion into China, India and the Middle East. Initiating the development of industrial and service clusters (including local businesses with State participation). Development of a platform of financial and business services	2000 - Development of existing clusters, identification and development of new ones through investment attraction, support for innovative businesses, technological development in areas of existing capacity and in a selective number of new areas. Internationalization of SMEs. Creation of new geographical spaces for investment and exports
Spain	1950 Inward-oriented and protectionist policies	1978 Trade liberalization, entry to the European Union and adhesion to its policies. Beginning of economic internationalization process. Strong infrastructure development, support for internationalization of small and medium-sized firms. Decentralization of certain economic responsibilities to the Autonomous Communities	1990 Promotion of Spanish FDI	2005 Strengthening of innovation
Sweden	1900 Export-oriented industrial development. Promotion of exports of forestry and mining commodities	1930 Construction of the welfare state. Exports of processed raw materials. Endogenous technological development. Differentiation of export products. Trade liberalization, protection from foreign investment	1975 Industrial policy designed to support major corporations (including via State procurement). Development of ICT and services sectors. Reduction of protectionist policies against FDI. Promotion of exports from the electronics, machinery, engineering, services and mining sectors	1990 Technological development and innovation. Strengthening of the national innovation system. Development of chemicals, pharmaceuticals and biotechnology

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of official documents from the countries concerned.

(i) Strategies are dynamic and change over time in response to changes in external and/or internal conditions. This area reveals a common shift —taking place at varying speeds depending on the country— towards the strengthening of export development and integration with the world economy. While structural change within a large country offers more opportunities in terms of the domestic market, small and medium-sized countries naturally focus their efforts on actions conducive to export development.[8] Although these countries are all open economies now, there have nonetheless been considerable differences among them in terms of the degree, content and timeline for trade and financial liberalization and for openness to foreign direct investment (FDI).

(ii) All the strategies are underpinned by macroeconomic policies designed to maintain fundamental balances. All the countries have experienced episodes of instability at one time or another, but in recent decades a focus on fundamental macroeconomic balances has been a constant.

(iii) In all the countries, a fundamental basis for strategy implementation is the strengthening of basic and secondary education and, increasingly, higher education as well. Educational development is a generational issue, and efforts are therefore undertaken from an early stage of development in these countries to increase coverage and quality throughout the various phases involved.

(iv) The strategies increasingly emphasize proactive public policies designed to overcome obstacle (including market failures) that obstruct the creation of new comparative advantages.

(v) In all the countries, there are medium- or long-term strategies. There are, however, significant differences in terms of their scope, depth, coherence and the degree of proactivity and structural orientation in their vision of the future.

(vi) The scope of public actions to promote export development, as well as their degree of horizontality versus focused application, varies from one priority area to another. Some countries have specific policies that are clearly focused on particular sectors, branches of activity or clusters, while others have a mix of horizontal policies combined with a selective approach to certain branches of activity. There are also differences in terms of whether intervention focuses on selected stakeholders or applied across the board, with the difference being between measures that target specific types of enterprises (transnationals, whether generic or of a particular type, small and medium-sized enterprises (SMEs), centres of excellence and universities, etc.) and those that do not target any one actor in particular.

(vii) Some strategies are linked to formal planning processes. In such cases, the structure and composition underlying those plans vary, of course, from country to country. Table VI.4 shows which countries (half those studied) had national plans. In the Czech Republic, Finland, Ireland and the Republic of Korea (before 1997), plans are created in a framework that reflects not only goals and priorities, but also a pluri-annual allocation of funding.[9] In contrast, Malaysia's plans do not allot funding, but they do contain targets —aspirations— and directives which are relatively well delineated. The existence of formal plans offers some advantages, particularly when they are

[8] This phenomenon is, of course, to be expected in smaller countries but, interestingly, it has also occurred in medium-sized and even large countries such as China. The role of export development as a growth factor comes as no surprise, since for decades now the world has been witnessing a rapid globalization process in which foreign trade has been growing much faster than world GDP. This has given countries an opportunity to boost growth both directly and indirectly by moving into external markets.

[9] Funding mechanisms vary considerably. In Ireland, for example, an allocation of resources is a "hard" budget commitment, while in Finland, the volume of resources allocated in the plan, like the plan itself, is only a guideline for the Government, albeit a highly influential one.

accompanied by resource allocations from finance ministries. First, formal plans constitute a systematic national analysis and establish forward-looking goals and priorities. Second, they not only validate and motivate the actions of the public bodies responsible for the strategies (development agencies) and give them authority to implement programmes and policies, but also can serve as a sort of indirect coordination mechanism; this institutional area will be discussed below. The inclusion of goals for which multi-year funding commitments are in place can help to raise the credibility of the strategy in the mind of the private sector and reinforce executing agencies' mandates. Lastly, ex post, the plan can serve as a public reference point, even assuming some degree of flexibility, for assessing the effectiveness of the authorities' actions. This is clearly the case in Finland and Ireland.

Table VI.4
NATIONAL PLANS

Czech Republic (after 1990)	Three-year plans
Czech Republic (before 1990)	Central planning
Finland	Three-year plans
Ireland	Seven-year plans
Malaysia	Indicative (complementary and interactive) plans that include a 30-year "vision", a 10-year framework plan and a budgeted five-year plan
Republic of Korea (up to 1993)	Five-year plans
Republic of Korea (1997 onward)	National plans are dropped, but each ministry has indicative plans

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of official documents from the countries concerned.

(viii) Some strategies, such as that of Australia, arise from a government's political platform and are, in essence, subject to political cycles. The national strategy which was in force until the recent change of government administration was, to a certain extent, simply a grouping or framework for government programmes already under way. The current strategy in New Zealand, which reflects the components of the current administration's political platform, combines the essence of the strategy implemented by the previous administration with a new, more structured approach for the coming 10 years, starting from 2006. This "economic transformation" initiative has reached the stage of defining goals, identifying opportunities and limitations, and formulating indicative plans of action. On the other hand, the strategies of countries such as Spain and Sweden are not set out in documents; they are of an informal or tacit nature and are reflected implicitly in government programmes.

(ix) National strategies and their components often overlap with strategies at the subnational level, with varying degrees of linkage. In more politically centralized countries, regional strategies are coordinated with the national strategy. In other cases the links may be weaker, and strategies may even be somewhat independent, as will be seen below in the case of Spain. Such a characteristic will inevitably have implications for the strategy's effectiveness.

3. Four strategic orientations

Although, national strategies cover a wide range of development topics, strengthening integration with the world economy and export development are invariably two key components of these strategies. In almost all the selected countries, strategic orientations in pursuit of this goal include support for FDI attraction, the internationalization of enterprises, export promotion and innovation.[10]

Strategic orientations can be defined as such within the national strategy, or can constitute relatively independent strategies. However, in the interest of organizing the analysis, in this case only pluri-annual, formally documented strategies will be considered.

As may be seen from table VI.5, innovation is the most widespread orientation in the selected countries. This element is related to the importance of raising countries' productivity in goods and services sectors and in terms of promoting future export development. Another important element revealed by this analysis is the fact that these orientations are generally linked, which means that one of these is sometimes integrated into the development of one of the other strategic orientation.

Table VI.5

FOUR STRATEGIC ORIENTATIONS FOR STRENGTHENING INTEGRATION WITH THE WORLD ECONOMY [a]

	FDI attraction	Internationalization of SMEs	Export promotion	Innovation
Australia	√			√
Czech Republic	√		√	√
Finland				√
Ireland	√	√	√	√
Malaysia	√	√	√	√
New Zealand		√	√	√
Republic of Korea		√	√	√
Singapore	√	√	√	√
Spain		√ [b]	√	√
Sweden				√

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of official documents from the relevant countries.

[a] The √ indicates a formally drawn up strategy that is in force.

[b] Refers to autonomous communities.

(a) Attraction of foreign investment

Attracting foreign investment has been of key importance in the strategies of countries that have sought to make rapid progress in industrialization and in the export of increasingly high-technology and high-value-added products. This is the case for Ireland, Malaysia, Singapore and, more recently, the Czech Republic (see table VI.6).

In countries whose export strategies have emphasized FDI attraction, the current strategy is oriented, owing to strong external competition, towards maintaining or improving the conditions of the business climate within the countries and a more selective approach in terms of investment attraction programmes, giving priority to output of higher technology goods and services.

[10] The situation varies considerably among countries, especially in terms of foreign direct investment as many countries have had a history of restrictions in that area.

Table VI.6
STRATEGIC ORIENTATION: FDI ATTRACTION

Australia	Selective FDI attraction oriented towards ICT, biotechnology, nanotechnology and financial services
Czech Republic	Attraction of focused FDI in high-technology goods and services: research and development centres, software, ICT, human sciences and financial infrastructure
Ireland	Investment focused on knowledge-intensive industries and financial products and customer services emphasizing the attraction of new, high-quality foreign investment
Malaysia	Orienting FDI towards specific industrial and services sectors with higher value-added and technology content, identified in the Third Industrial Plan
Republic of Korea	Improving the business climate by refining legislation and simplifying formalities to facilitate corporate operations. Providing information and assistance in the framework of a sort of "one-stop shop". Improving the credibility of the country brand
Singapore	Flexible and efficient business environment, reduction of direct taxes on production, improvements to legislation regarding foreign workers to hold down operating costs and attraction of companies in the high-technology fields mentioned in the national strategy
Spain	(A strategy is being prepared in this area)
Sweden	Presented within the innovation strategy

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

(b) Internationalization of businesses

Given that the internationalization of businesses is seen as the end result of a process in which local firms gain access to external markets and foreign investment, the following dimensions are involved: (i) linking local businesses into international value and export chains; (ii) linkages as suppliers to locally based transnational corporations; (iii) technological upgrading (especially for SMEs); and (iv) training for export and investment abroad (again, mainly for SMEs).

The internationalization of businesses represents another strategic priority for some countries' efforts to boost competitiveness. There are various reasons for this. On the one hand, there are countries such as the Czech Republic, Ireland and Malaysia, where export development has been led by transnational corporations, while local industry has lagged behind in terms of structural change. In such cases, the strategy aims to produce the right conditions to enable them to become integrated into transnationals' value chains as input suppliers. In some sectors, such as the automotive industry in the Czech Republic, the existence of a competitive local industry makes all the difference in terms of the establishment of a transnational in the country. Moreover, generally speaking, it is thought that the creation of attractive local suppliers reduces the likelihood of existing FDI moving elsewhere.

In other countries, local firms are being encouraged to go transnational in terms of goods as well as services, by making the most of access to markets, technology and innovation. This is occurring in countries where local businesses have embarked upon a globalization process and have begun to transfer part of their production outside the country, as in the case of the Republic of Korea, thereby making it necessary for local industries to look for alternatives. Singapore[11] and Spain also promote the international integration of local businesses, some of which have become multinational.

[11] For several years, Singapore has been running a vigorous incentive programme to link local businesses (a significant number with State participation) to multinationals.

In other countries, efforts are primarily focused on promoting innovation and business start-ups by introducing entrepreneurs to special academic-business liaison programmes or business associations as a means of fostering innovation. This strategy is quite common in all the countries, but receives very high priority in Finland and Sweden (see table VI.7).

Table VI.7
STRATEGIC ORIENTATION: INTERNATIONALIZATION OF BUSINESSES

Australia	Included in the innovation strategy
Czech Republic	Included in the export promotion and innovation strategies
Finland	Included in innovation strategies
Ireland	Promotion of companies with high export potential through financing, innovation and creation of links with transnational corporations and international production chains
Malaysia	Promoting the development of industrial SMEs by linking them to the supply chains of transnational corporations and international export chains. Included in the innovation strategy
New Zealand	Promoting firms’ global connections and competitiveness by developing their capacities and the underlying infrastructure, particularly ICT and energy
Republic of Korea	Improvement of SMEs’ competitiveness through funds for the development of products with export potential, training for the development of internationalization strategies and a special insurance programme for exchange-rate risks. It also promotes coordination with large corporations
Singapore	Promoting the development of new export businesses in the four strategic manufacturing areas (biomedical, chemical, electronic and engineering). Promoting the development of the export-oriented services sector as well as health, education and creative industries; boost traditional sectors such as commerce; and strengthen logistics, ICT, financial services and tourism. Promoting the development of investments outside Singapore by local businesses, through cooperation in project financing, technical advisory services, creation of industrial estates outside the country and promotion of external contact networks
Spain	Included in the innovation and export strategies. The autonomous communities have their own strategies
Sweden	Included in the innovation strategy

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

(c) Export promotion

Export promotion is another strategic area. Here, the goals are to provide better information about potential markets to other countries, promote the country’s image, put suppliers and buyers into contact with one another, and improve the quality both of goods and services and of their market access (see table VI.8).

These strategies are also aimed at improving local infrastructure and international marketing channels and providing high-quality services to exporters such as training, attaining ISO ratings, and other such activities.

Table VI.8
STRATEGIC ORIENTATION: EXPORT PROMOTION

Ireland	Creation of greater knowledge of individual businesses and of the country, as a source of supply Promoting knowledge of external markets Supporting marketing outside the country
Czech Republic	Supporting higher value-added and higher-productivity exports. Maintaining market share in the European Union countries, increasing share in emerging markets, especially China, India, the Russian Federation and Latin America. Providing services to exporters with quality standards equivalent to those of the most developed European Union countries by 2010, and supporting Czech FDI
Malaysia	Strengthening exports of industries and services considered to have strong potential: natural resources, ICT, pharmaceuticals, health products, education and construction
New Zealand	Promoting exports based on commodities and biotechnology, and developing new strengths in areas such as tourism, internationalization of the education industry and creative sectors
Republic of Korea	Developing a medium- to long-term plan for the sector
Singapore	Promoting free trade agreements for market access; promoting the country as a regional centre for finance and tourism
Spain	Improving the quality and reliability of Spanish goods and services sold in external markets, moving from purely mercantilist policies (foreign-exchange inflows and job creation through exports and foreign investment in Spain) to policies that promote investment outside the country by Spanish businesses

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

(d) Innovation

Lastly, as stated earlier, strategies are providing an increasingly strong boost for innovation, as all countries are aware that the future of their export development and international growth depends on the creation of new goods and services and on improved productivity, especially because of the emergence of competition from countries such as China, India and Viet Nam. The national strategies of other countries, such as Finland, the Republic of Korea and Sweden, have moved from the field of industrial policy to that of innovation policies. In Finland and Singapore, this has resulted in a reform of national innovation systems and a large increase in public funds allocated for promoting research and development and innovation by private businesses.

Other countries that are relatively less developed in regard to innovation are trying to narrow the R&D and innovation gaps that separate them from the more industrialized OECD countries (see table VI.9). This is the case for the Czech Republic, Ireland, Malaysia and Spain, which are lagging behind in their innovation efforts. This effort entails promoting investments in infrastructure for innovation, human capital and closer links between businesses, the academic world and government. This type of networking is vitally important for innovation. In most of the countries mentioned above, priority support is being given to selected activities or sectors. Australia and New Zealand, whose principal exports continue to be natural resources, are focusing their innovation efforts on biotechnology and ICT as applied to those resources.

Table VI.9
STRATEGIC ORIENTATION: INNOVATION

Australia	Diversification and increased value added in natural-resource based industries. Development of biotechnology and ICT
Czech Republic	Strengthening research and development as a source of innovation. Establishing no more than seven priority areas for public investment. Strengthening public-private partnerships. Human resources training. Increasing the competitiveness of the economy by incorporating innovation into industry and services, to attain levels close to those of the industrialized European Union countries. Improving the public administration of innovation, consolidating sources of funding for research and development and the administration of support for innovation
Finland	Maintaining the strong positions of the forestry sector, the metals industry and ICT on the world market, while developing innovation in promising areas including: biotechnology, new software materials, nanotechnology, knowledge-intensive services and social well-being industries. Strengthening centres of excellence. Creating a working group to develop a sectoral innovation plan. Forging closer links between national and regional actors
Ireland	Developing a world-class level of research based on investment in the development of related infrastructure and human capital at the highest level. Developing business-sector linkages with research and development activities. Focusing research on sectors considered to be of key importance for leading economic and social growth: biosciences, bioengineering and ICT, as well as traditional areas
Malaysia	Developing a knowledge-based economy, increasing the role of the private sector in research and development and in innovation. Two critical areas in the strategic vision are ICT and the electrical and electronics industry. Strengthening the institutional framework and the efficiency of its services.
New Zealand	Guiding investment in innovative ICT and biotechnology activities and creative industries. Strengthening collaboration between firms and with the academic world. Boosting the commercialization of innovation. Improving the return on public investment in innovation.
Republic of Korea	Moving from a capital-driven industrial strategy to one driven by innovation, emphasizing technology and efficiency. There is also a particular focus on the 193 products with established high potential
Singapore	Increasing spending on research and development to 3% of GDP by 2010. Focusing spending on a small number of areas where it can be competitive: existing clusters (electronics, chemicals, marine engineering, biomedicine) and new areas based on competitive strengths and/or growth potential: water technology, interactive digital media. Striking a balance between basic and applied research. Further developing private research and establishing more research-and-development links with business
Spain	Closing the gap in innovation and research and development with respect to the European Union countries in the framework of the Lisbon Strategy and of agreements on the use of European Union funds
Sweden	Maintaining the country’s leadership in research and education, with emphasis on science and mathematics. Establish priorities in areas of basic and applied research. Improving links between businesses and the academic world. Strengthening innovation in SMEs. Promoting research-based projects and businesses

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

B. The nature and role of public-private alliances

An analysis of the characteristics of such strategies should be followed by an examination of an important secondary characteristic: the social participation and support for such strategies, starting from their design stage and continuing on until their implementation. This social process consists of types of collaboration among the various actors which are referred to as public-private alliances. This topic leads us to the second “first principle”.

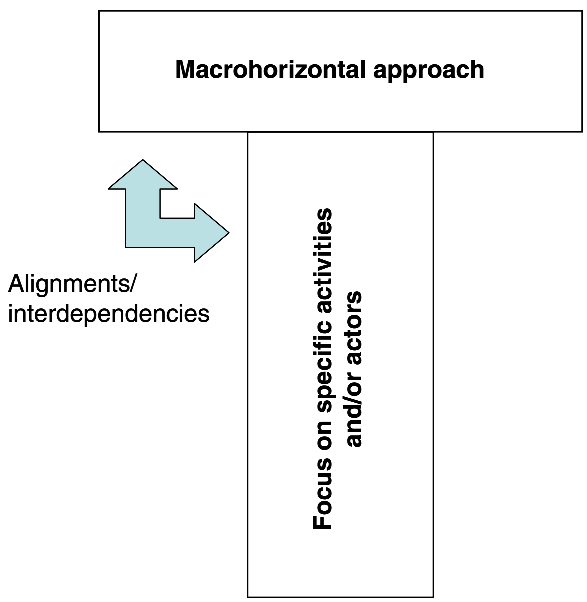
Second principle

Public-private alliances are vital for the formulation and implementation of strategies in an era of globalization and growing international competition.

An analysis of the selected countries' strategies shows that a strategy based on a structural approach arises, in the first instance, from an examination and assessment of key opportunities for market positioning based on a medium- or long-term perspective and an awareness of the main constraints that must be overcome, reduced or removed in order to ensure that the country can benefit from those opportunities. Clearly, the chosen objectives must be empirically based on real capacity of the economy and on the short-, medium- and long-term trends detected in the external environment.[12] Public policies and programmes designed to overcome such primary constraints must take into account, inter alia, the realities of the country concerned, the capacity of the public and private sectors, and the types of actions that will best motivate the private sector to take decisions conducive to achieving strategic goals.

Lastly, the strategy's goals and programmes at the macroeconomic and/or horizontal levels must be aligned with goals and programmes relating to specific activities or sectors in order to combine market signals with government incentives (see figure VI.3)

Figure VI.3
ALIGNMENT OF STRATEGY POLICIES AND PROGRAMMES



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of T. Cutler, "Public and private sector alliances for innovation and economic development: the Australian experience", Santiago, Chile, 2008, unpublished.

Today, unlike the decades immediately following the Second World War, most countries' production structures are in private hands. Private enterprises are the ones that are active in the markets. In their business operations, enterprises handle information which, although incomplete, could be very valuable in carrying out the difficult task of identifying commercial opportunities and restrictions (including those resulting from public policies) related to structural change and productivity growth. In terms of improving development, this approach would involve strengthening existing activities or entering into new ones. Nonetheless, companies can be short-

[12] As Cutler (2008) points out, the development of an effective vision of the future requires an assessment, among other things, of long-term trends in the environment. Nonetheless, to truly determine the underlying long-term trend in the environment, past trends must be borne in mind; it would be unusual for future changes not to be affected by former trends.

sighted in decisions and actions to improve performance. This is due to externalities and market failures relating to issues such as access to information in a rapidly changing, globalized world, firstmover advantages, optimal coordination in the business world, appropiation of the benefits of innovation and technological developments.

While governments also have shortcomings and are not necessarily better informed than the private sector, they have, by virtue of their political leadership, the potential to stimulate proactive strategic thinking with a forward-looking vision and to coordinate collective action as a public good. Thus, when both parties are working together they can increase their individual potential to support mechanisms and programmes that help to identify opportunities and restrictions and overcome primary market failures, as well as those caused by the very public policies adopted for regulatory and programme purposes. Consequently, as Rodrik (2004) has correctly remarked, the key to a modern industrial policy is to pay close attention to the process and design of public-private alliances in order to ensure that public interests are not captured by private stakeholders and that it is possible to obtain the information needed to identify and deal with the primary restrictions that hold back efforts to achieve upgrading of production activity and exports.[13]

In addition, depending on the area of interest, some of the information required for diagnostics and intelligent strategies is held by non-commercial agents, such as academics (including researchers) and trade unions. Consensus, or at least an understanding, that generates sufficient public acceptance must be developed to ensure that strategies and their financing[14] have the necessary political support to survive in the medium and long term. This is why, in many cases, alliances should also incorporate groups other than the business sector.[15]

1. The scope of public-private alliances

(a) Framework for analysis

The scope of public-private alliances is set out schematically in figure VI.4. The dynamic for involving an alliance in building a strategy is shown on the left. As is shown in the figure, the construction of an alliance and the role it will play in formulating and implementing strategies clearly depends on the political context in the country, which in some cases (together with the economic circumstances and institutional framework of the alliance itself) leads to what is tantamount to a veritable public consensus.[16] In other cases, the nature of the political context may lead to an alliance that is best described as a public understanding, or passive acceptance, of the strategy. But, in one way or other, it is the consensus or understanding, and the different ranges and nuances involved, that condition the formulation and implementation of a strategy.

Also, in terms of achieving consensus and understanding, the interaction between the parties of an alliance may vary both in the form of the discourse and in its scope. The left (vertical) axis of figure VI.4 shows that the discourse between government and private-sector stakeholders may range, along a non-discrete scale, from a true dialogue to a consultation of the private sector by the

13 Depending on the level of development and on the country's short-term economic situation, primary constraints on sustained growth may be concentrated in the macro-, meso- and micro-economic sectors. Hausmann, Rodrik and Velasco (2005) have developed some ideas on how to approach a systematic diagnosis and prioritization in this regard.

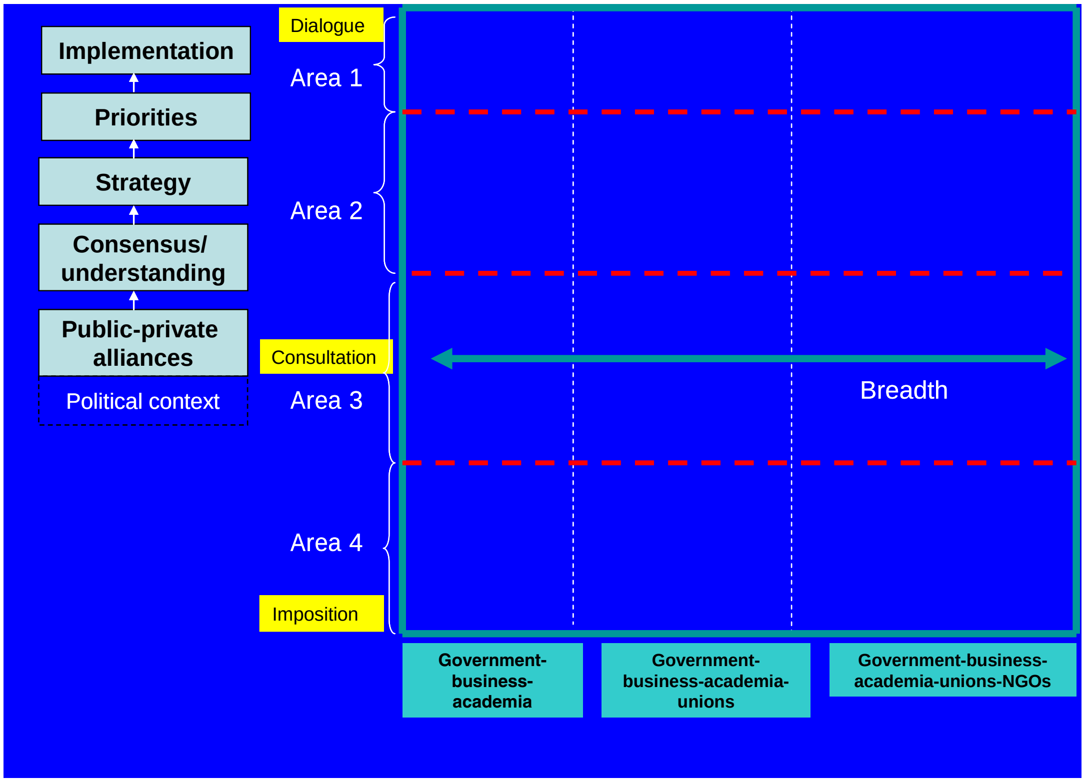
14 If the strategy does not have some degree of acceptance, the allocation of scarce resources for its implementation may cause tensions. Some areas of a strategy —for example, public spending in support of research and development and innovation may not be readily accepted politically by the public, in comparison with other items of expenditure such as poverty reduction programmes. Thus, an explicitly constructed public understanding or consensus might therefore facilitate a stable place in the budget.

15 As stated by Prats i Català (2005), the weakest sectors could require support in order to become effective actors in a dialogue.

16 According to a joint study by ECLAC, the International Institute for Democracy and Electoral Assistance (IDEA) and the World Bank (2005, p. 3) "The process of building a national Vision does not have a unique format but must be adapted to the country situation and the particularities of the participating stakeholders".

government, and finally to a situation where the government imposes its strategy without any great attempt at dialogue or public consultation.

Figure VI.4
THE PLAYING FIELD FOR PUBLIC-PRIVATE ALLIANCES



Source: Economic Commission for Latin America and the Caribbean (ECLAC).

The extent of social participation in the alliance may also vary. The horizontal axis of figure VI.4 shows that the spectrum may range from a trilateral relationship between the government, business and academia, to a very broad partnership including practically all the main social groups.

Lastly, a third dimension, not reflected in figure VI.4, must also be taken into account: the operational structure. In this case three stylized variants may be identified: first, an alliance that operates through formal and explicit structures; second, an alliance that operates with formal structures but that emerge on an ad-hoc basis; and third, alliances that function as informal networks or through tacit agreements. In practice, the three structures are present or co-exist in any public-private alliance. However, some structures may be expected to predominate.

(b) Alliances in selected countries

Table VI.10 sums up the nature of alliances for formulating national development strategies by highlighting, for each country: the predominant structures of the partnership, its main stakeholders; and the principal means of engagement. Table VI.11 does the same at the level of national strategy implementation, through the four strategic orientations for strengthening integration with the world economy and export development.

Table VI.10
THE NATURE OF PUBLIC-PRIVATE ALLIANCES IN NATIONAL STRATEGY FORMULATION

Country	**Type of alliance**	**Participants**	**Means of engagement**
Australia	Formal ad hoc	(i) Government-business-academia-trade unions (pre-1996) (ii) Government-business-academia (post-1996)	Ad hoc convening of summits, committees and councils
Czech Republic	Formal structured; formal ad hoc	Government-business-academia-trade unions	Council for Economic and Social Agreement, as well as forums and formal consultation meetings
Finland	Formal structured	Government-business-academia-trade unions	Participation in the Science and Technology Policy Council, together with participation on the boards of specialized agencies that provide inputs
Ireland	Formal structured	Government-business-academia-trade unions-NGOs	Permanent forums at a very high level, such as the National Economic and Social Council (NESC), the National Competitiveness Council (NCC), the Expert Group on Future Skills Needs (EGFSN), etc., as well as participation in the board of Forfás (which is the "brain" of the public sector in the area of strategies for international integration). In addition, the National Plan is discussed at length with other representatives of society
Malaysia	Formal structured; formal ad hoc; informal/tacit	Government-business-academia	Representatives of the business sector are invited to express their views and provide inputs for the preparation of the National Plan. In preparation for the Industrial Master Plan, a high-level steering committee was set up for the business sector, which coordinates working groups. Other views are also received through forums, meetings and informal communications
New Zealand	Formal structured; formal ad hoc; informal/tacit	(i) Government-business-academia (pre-1999) (b)Government-business-academia-trade union (post-1999)	Documents, formal mechanisms, such as the Growth and Innovation Advisory Board (GIAB); participation on boards of specialized agencies; ad hoc arrangements (meetings, working groups and consultancy, etc.) and informal communications
Republic of Korea (post-1990)	Formal ad-hoc; informal/tacit	Government-business-academia	Convening ad hoc committees of experts to fulfil specific tasks, public forums and an important role for informal communication, especially between the government and the chaebols
Singapore	Formal structured	Government-business-academia-trade unions	The private sector participates in the boards of two important agencies and a council that are responsible for strategy development: the Economic Development Board (EDB); National Science Foundation (NSF); and the Research, Innovation and Enterprise Council (RIEC). It is also represented in specialized agencies and committees
Spain	Informal/tacit	Government-business-academia	Mainly informal/tacit through communication with trade unions/associations, some with joint financing by the Government. In the 1980s, in preparation for entry into the European Union, there were extensive formal consultation arrangements, which helped to build consensus on the strategy for internationalization, which exists to this day
Sweden	Informal/tacit	Government-business	The government has an informal/tacit relationship with large Swedish transnational corporations, academia and the trade unions (in the context of wages)

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of official documents from the respective countries.

Table VI.11
NATURE OF PUBLIC-PRIVATE ALLIANCES FOR STRATEGY IMPLEMENTATION

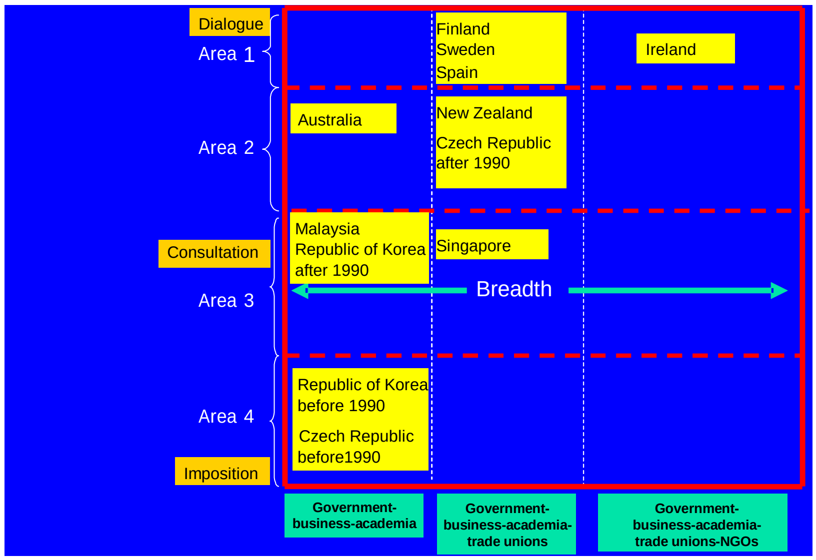
Country	Type of partnership	Participants	Means of engagement
Australia	Formal structured; informal/tacit	Business sector and academia	The private sector participates very actively with operational responsibilities on the boards of public agencies supporting R&D/innovation. Informal contacts are predominant in other areas
Czech Republic	Formal structured	Business sector, academia and some monitoring committees include trade unions and NGOs	Participation on the board of directors of Czech Invest (only in an advisory capacity) and on programme monitoring committees
Finland	Formal structured	Business sector, academia and trade unions	Participation on boards of executing agencies with operational responsibilities
Ireland	Formal structured	Business sector and academia	Participation on boards of executing agencies with operational responsibilities
Malaysia	Formal structured; informal/tacit	Business sector and academia	Participation on boards of directors of executing agencies with advisory responsibilities and informal contacts
New Zealand	Formal structured	Business sector; in some cases, trade unions	Participation on boards of executing agencies with operational responsibilities
Republic of Korea	Informal/tacit	Business sector and academia	Informal/tacit
Singapore	Formal structured	Business sector and academia	Participation on boards of executing agencies (in an advisory capacity only) and on councils
Spain	Formal structured; informal/tacit	Business sector and academia	Formal in the area of export promotion through recent participation on the board of directors of ICEX, together with informal channels with trade unions and in the area of innovation
Sweden	Informal/tacit	Business sector and academia	Informal/tacit

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of official documents from the respective countries.

The nature of national alliances can be illustrated using the information in the two tables shown above and the potential areas of interaction indicated in figure VI.4. Ireland and Finland, for example, have alliances that are very broad, are formally structured, and have extensive coverage in the public-sector hierarchy in terms of strategy formulation and implementation. The end result is something that is tantamount to social dialogue and agreements on strategies that approximate a consensus which transcends political cycles. Therefore, these countries may be placed in area 1 of figure VI.5, with an alliance that, as indicated in table VI.11, encompasses the government, business, trade unions, academia and, in the case of Ireland, non-governmental organizations (NGOs).

Singapore also has a relatively broad alliance, which is well structured and has extensive coverage in the public-sector hierarchy involved in strategy formulation and implementation. Malaysia shares the same characteristics, except that there is no trade-union participation in the alliance.[17] In these two cases, however, this process results in a consultation by the government with the partners in the alliance rather than dialogue, after which the government comes to a decision and announces its strategy. The outcome is a public understanding rather than a consensus as such. Both countries would thus be positioned in area 3 of figure VI.5 for their respective groupings in the alliance, but, clearly, Singapore's profile is the most clear-cut in terms of this characterization.

Figure VI.5
POSITION OF COUNTRIES IN TERMS OF ALLIANCES



Source: Economic Commission for Latin America and the Caribbean (ECLAC).

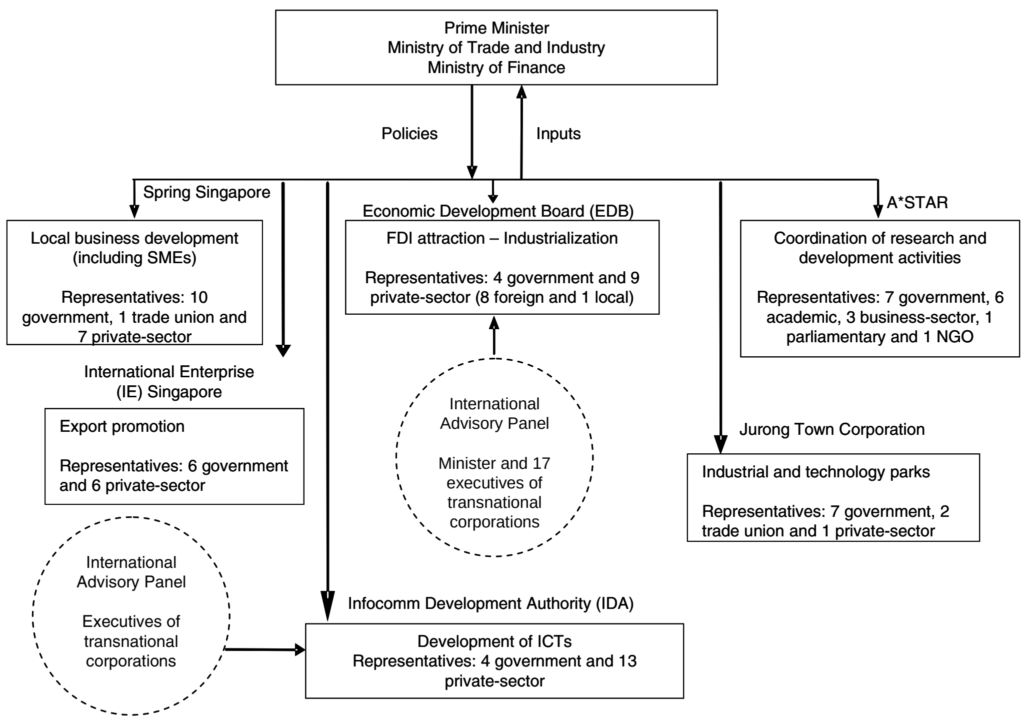
The depth of the alliance in these four countries is important in terms of the level of penetration in the government hierarchy (especially in Ireland and Singapore), since it contributes to the flow of information, coordination of processes and the degree of consensus or understanding. Figure VI.6 illustrates the institutional framework established in Singapore. The interaction with the private sector is very comprehensive, with representatives of firms participating on boards of agencies including the Economic Development Board (EDB), which has traditionally been the brains behind the country's development strategies. In addition, transnational companies with operations in the country (and foreign academics, in the case of the Agency for Science, Technology and Research (A*STAR)) are represented. This reflects the fact that transnationals are very important in the country's productive apparatus, but also shows that the government attaches a high priority to capturing international intelligence for its strategy through this interaction. If there had been the same type of figure for Ireland, the profile would be very similar except that, in Singapore, the boards of directors only comment and make periodic appraisals of policies and programmes, while in Ireland, directors also have operational responsibilities.

Singapore, and to a lesser extent, Ireland and Malaysia have another alliance modality: International Advisory Panels. Examples of these panels include the Economic Development Board (EDB) and the Infocomm Development Authority of Singapore (IDA) shown in figure VI.6. EDB has traditionally played a very important role in formulating and implementing development strategies. Each year, it organizes an important meeting (along with social events) at which private discussions are held at a very high political level between the government and chief executive officers (CEOs) of major transnational companies on globalization trends, trends in the region of South East Asia, technological and strategic changes. At the end of the meeting a press report is

[17] It should be noted that trade unions in Singapore do have some links with the government.

issued. This event not only provides an opportunity to exchange information relevant to national strategies, but also creates a network of contacts in the international market and helps to identify concrete opportunities for the country.[18] An example of the same strategy, but at the academic level, is the International Advisory Panel, which includes various Nobel prize winners, of the Agency for Science, Technology and Research (A*STAR), a very high-level body that operates in the context of the National Research Foundation (NRF), the agency which leads innovation strategy and its implementation.[19] In 2005, Malaysia also formed an International Council for its latest National Plan, which has similar characteristics to that of Singapore and which involves senior international figures from academia and the private sector.

Figure VI.6
SINGAPORE: BOARDS OF AGENCIES SUPPORTING INTEGRATION WITH THE WORLD ECONOMY



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of official documents from Singapore.

In the Irish alliance, representatives of the main social groups convene regularly in a special council presided over by the Prime Minister, where discussions are held (with technical support) to achieve consensus on future socio-economic directions for the country (see box VI.1). This is considered to be one of the keys to the success of the alliance and of the Irish economic model.

[18] General managers of multinational companies may also be attracted to the meeting by the opportunity to learn about topics of interest for doing business in East Asia.

[19] The private representatives serving on the board of directors of the National Research Foundation and the Research, Innovation and Enterprise Council (by which it is guided) are all Singapore nationals.

Box VI.1

THE NATIONAL ECONOMIC AND SOCIAL COUNCIL (NESC) OF IRELAND: STRUCTURE AND OPERATION

The national economic and social council (NESC) dates back to the early 1960s and started as an exercise in bringing together representatives of employer associations, trade unions, farmers' organizations and senior public officials. More recently NGOs have joined the group. The original purpose of the council was to create a forum where groups and organizations with diverse interests could come together to discuss the country's economic and social development. In the 1970s and 1980s, NESC served as a peaceful forum for discussion in Ireland. Since the crisis of macroeconomic imbalance, recession and unemployment in the second half of the 1980s, NESC has evolved into a genuine forum for common understanding and social agreements in the framework of an economic policy conducive to high and sustained growth with social equity.

Today's NESC analyses medium- and long-term strategic issues for the economy and reports to the Prime Minister with recommendations on the future course to be followed in terms of policies and programmes. The Council is chaired by the Secretary-General of the Department of the Prime Minister and includes the secretaries-general of certain government departments (ministries) and five representatives of each of the following sectors: trade unions, labour union, farmers' organizations, NGOs and independent representatives (normally technical experts or academics). The government invites nominations from the respective social groups and appoints independent participants, whose orientation is not entirely different from that of the government. The term of office is three years.

NESC receives technical and administrative support from a semi-autonomous secretariat of nine persons, most of whom are technical experts, all with master's degrees or doctorates. The Director is an economist held in high esteem in Ireland and is recognized as politically impartial. The officials are contracted through competitive examinations and granted contracts as temporary employees of the State. The NESC budget for 2007 was 1.1 million euros. The council meets once a month and its decisions are taken by consensus. The NESC triennial report is the strategic input for negotiation of the national social agreement between the government, business and trade unions and serves as a highly influential guide for the government in the formulation of the national plan. The activity of NESC began to be effectively consolidated as from 1986, when the council successfully laid the foundations for the negotiation between the government and the different social actors, leading to a three-year social agreement on wages, taxes and social spending within the framework of a programme of growth, employment and fiscal balance. Once the macroeconomic imbalance had been overcome, subsequent reports focused on other strategic issues, inter alia, competitiveness policies, supply policies, industrial and service policies and the knowledge economy, all explicitly underpinned by social cohesion policies (see the websites of the government of Ireland (http://www.irlgov.ie/) and NESC (http://www.nesc.ie)).

As the NESC agenda evolved, in 1993, the government created another forum for the partnership, the National Economic and Social Forum (NESF) which was responsible for long-term issues particularly in relation to employment and social cohesion (for further information on NESF and other specialized social dialogue forums in Ireland, see Doyle, 2005). With the incorporation of NGOs into the partnership, a clearer division of labour was established between the two entities, giving NESC exclusive responsibility for the national strategic vision and NESF the responsibility for implementation policies. The two forums are both coordinated by the National Economic and Social Development Office.

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of David O'Donovan, "Public-Private Partnerships for Innovation and Export Development: The Irish Model of Development", Santiago, Chile, 2008, unpublished.

Australia and New Zealand are intermediate cases within the classification of figure VI.5. The character of these alliances is related to the coalitions constructed within the framework of political platforms of the administrations in power. The alliance in Australia exists mainly among the government, business and academia, although this is probably changing with the recent victory of an Administration thay has ties to the labour sectors. New Zealand had an alliance with businesses and academia up to 1999, when a new Administration incorporated and gave more attention to the labour sector. The predominant structures of these alliances are "fluid", reflecting in part a certain aversion to corporatism, albeit for different reasons. In the case of Australia, until recently, the Administration in office took a quite orthodox stance. In New Zealand, the government, following a long period of liberal economic policies, found it difficult to establish a consensus with the business sector and the political opposition, and was therefore unable to consolidate an Irish-type model in terms of alliances and consensus-building. The hybrid structure of the alliance does not have either the stability or the coordination to generate lasting agreements at the national level that are conducive to the implementation of a well-structured global strategy capable of overcoming electoral policy. This accounts, in part, for the slow and partial progress achieved despite the fact that two strategic and complementary medium- and long-term initiatives were launched to promote economic transformation in New Zealand.[20]

In both countries, a more structured and deeper alliance does exist in the context of certain strategic areas. This is especially striking in the field of innovation, where corporate-sector and academic representatives participate fully and assume operational responsibility on the boards of specialized agencies. Nevertheless, these two countries are located in the intermediate area (area 2) of figure VI.5.

The Czech Republic also belongs to area 2 of figure VI.5. This country has fairly well-structured formal forums, with broad participation and active interaction between the public and private sectors, both at the level of national strategies and in terms of their implementation. However, their importance in decision-making has been strongly influenced by the ideology of the different government coalitions that have assumed power since the restoration of democratic rule.[21]

Spain, for its part, has been able to build consensus on its national strategy during the process of democratization and integration in the European Union with forums, committees, working groups, and so forth. While that consensus is still valid today, the predominant modality for interaction of the allaince at the level of the central government and its specialized agencies is an informal one and one which functions principally with trade unions and business associations, some of which originate in, and are partly funded by, the public sector.[22] Spain is probably located in area 1 of figure VI.5. In Sweden, where there is a high level of consensus, the alliance is largely informal/tacit and therefore less easy to describe.

The Republic of Korea and the Czech Republic prior to the 1990s were at the other end of the spectrum. Both countries would have been located at the extreme bottom left of figure VI.4 (area 4), since strategy formulation and implementation were almost exclusively the domain of the government and its technocrats. In the Republic of Korea prior to democratization, the plans guided the activities of the major conglomerates ("chaebols"), with a range of unilaterally applied incentives and penalties. The Republic of Korea, which now has a fairly sophisticated economy, has dispensed with the national plans and the chaebols have a large degree of business independence. While today's democratic framework includes growing government recognition of the value of public-private alliances for supporting strategies, the country is still in transition in this regard.

The scope for alliances is more limited at the level of strategy implementation than at the formulation level and generally involves business and/or academia (table VI.11).

To conclude, the most complete and functional alliances for formulating medium- and long-term strategies with sufficient public consensus or understanding to avoid pendulum swings are to be found in Ireland, Finland, Singapore, Malaysia, Spain and Sweden. The alliances in Australia, New Zealand and the Czech Republic are less solid or effective, while the Republic of Korea is in the midst of a transition from a bureaucratic development model to a more open social model.

2. Consensus-building

Medium- and long-term strategies based on a high degree of consensus between the public and the private sectors can give better results for a number of reasons. Consensus suggests that there will be stability and consistency between electoral cycles, is a factor that promotes "inclusion" of

[20] See "Growth and Innovation Framework" (GIF) (2002) and "Economic Transformation" (ET) (2005).

[21] The European Union has been a positive influence in terms of alliances through its insistence on a broad social dialogue concerning the use of cooperation funds.

[22] In Andalusia, the alliance is formal, structured and essentially tripartite; however, the private sector is not particularly proactive (see box VI.6).

stakeholders in the strategies and serves also as an implicit public evaluation of the effectiveness of such strategies and associated public policies. Even more important, processes geared to building consensus in relation to a strategy have the potential to mobilize and incorporate the country's best information, perspectives and skills, as well as engendering stable financing commitments in accordance with agreed priorities.

Unfortunately, consensus-building is no easy task. It depends on many factors, such as cultural disposition, political structures and the configuration and power of the different social groups, leadership and political vision, the representativeness and public prestige of the social interlocutors, the sense of urgency, the success of policies that emerge from nascent consensuses, and so forth.[23] Nevertheless, properly structured institutional frameworks can, over time, also help to build consensus.

In this regard, the experience of Ireland is quite interesting. This country was one of the poorest in Europe. Since the late 1980s, however, it has managed to build a consensus for its development and integration in the global economy that has led to one of the greatest economic transformations in the post-war period. Tables V.10 and V.11 show that the institutional framework of the alliance covers many dimensions of the formulation and implementation of medium- and long-term strategies. Nevertheless, as mentioned earlier, one particular entity, the National Economic and Social Council (NESC), has, throughout its decades of work, played a significant role in achieving consensus in economic policy areas. NESC developed from a public body that allowed representatives of the different social groups to exchange ideas, into a forum that facilitates the generation of consensus on the future course of the economy. As part of this process, NESC has also developed a methodology for conducting the discussions in such a manner that it produces meaningful dialogue and consensus (see box VI.2). It should be pointed out that Ireland had been formulating medium- and long-term strategies that were implemented through its national plans for over two decades prior to the full consensus reached in the 1980s.

The NESC methodology described in box VI.2 may be illustrated by the deliberations on the national recovery strategy for 1986, when stabilizing the economy was a matter of urgency. At the monthly meetings of the Council, in-depth analyses of the issues involved were carried out under the guidance of the Chairman of the Council and on the basis of studies prepared by the secretariat. In order to arrive at a common understanding, the focus of the discussion was shifted from the annual fiscal deficit to the debt-to-GDP ratio. This facilitated a more constructive exchange of opinions. First, it was observed that, despite cuts in public spending, the fiscal situation was continuing to deteriorate and the record high world interest rates then prevailing were giving rise to a heavy debt-servicing burden. The multi-year debt build-up was therefore a more important issue than the deficit in any given year. Second, it was noted that the Irish crisis went beyond fiscal deterioration and stemmed in part from the sluggish rate of growth in the economy. Futhermore, based on this understanding, it was realized that the poor performance was due not just to the macroeconomic problem, but also to the style of development in the country. In addition to formulating macroeconomic recommendations, the Council also placed emphasis on the challenge posed by the need to achieve development together with structural change and productivity growth: the need to develop comparative advantages beyond that of agriculture. In order to promote policies in this area, the group has also analysed the primary constraints in this area and recommended industrial policies for overcoming them. With the restoration of macroeconomic equilibrium, this last dimension of the NESC approach has gained an even higher profile in subsequent reports.[24]

[23] One fairly common factor in the selected countries is that the consensus (or understanding) has often emerged during a crisis that has served, together with other factors, as a catalyst for constructing a common vision.

[24] For an analysis of the dynamics of various evidence-based consensus-building strategies, see Caillaud and Tirole (2007). For more information on leadership, dialogue, consensus and representative groups, see Prats i Català (2005).

Box VI.2

NATIONAL ECONOMIC AND SOCIAL COUNCIL (NESC), IRELAND: METHODOLOGY FOR BUILDING CONSENSUS

Rather than entering into discussions on current issues, the National Economic and Social Council (NESC) makes recommendations based on broad principles relating to Ireland's medium- and long-term socio-economic policies and programmes. The aim is to agree on an analytical framework that will facilitate adoption of a social agreement, establishment of a national strategy and introduction of government programmes under the National Plan. The alliance that is embodied in the NESC has various dimensions: consultation and covenants between partners who share a functional interdependence, and a sense of solidarity, social cohesion and participation. The effective alliance incorporates both dimensions, as depending exclusively on the first would give too much importance to the relative power of the partners, while depending only on the second could be an overly simplistic vision of inclusion, reducing the process to a consultation in which the interested parties merely express their points of view and needs.

However, there is a third dimension: negotiation. Building consensus implies that the partners must come to the table without views set in stone or the aim of maximizing their gains, but must be willing to be part of a process of deliberation that has the potential to formulate and reformulate agreement on problems and solutions, as well as on the identity and preferences of the participants; the result approximates creating a public good. Thus, the process of developing partnerships depends on the capacity to promote an understanding and to approach deliberation with a view to solving a problem in order to produce consensus.

Indeed, the key to the NESC process may be the method of deliberation. First, problem-solving is assumed to be the central mandate of participants. Second, the mechanism for deliberation is geared to solving one or more problems through a dialogue supported by inputs from impartial experts and working groups that help to create a common definition of problems. The particularity of this approach is that partners do not argue over a definitive point of view. Rather, faced with empirical evidence presented by an impartial technical secretariat and the mandate to solve a problem, a sort of joint decision may emerge among the partners. Participants are bound to explain, give justifications and take responsibility for their proposals to their partners in the alliance, their affiliates and the general public. Thus, understanding and consensus are not a prerequisite for the partnership but rather the result of it.

Another important element in consensus-building is social cohesion, which is a constant objective throughout the deliberations on the management and content of future strategies. The experience of NESC demonstrates that pragmatic deliberations geared towards the solution of a specific problem can produce consensus even when there are underlying conflicts of interest and there is no initial understanding. Another key aspect is that consensus achieved through NESC is always provisional. In other words, consensus allows interlocutors to proceed with a recommendation for pragmatic action, while reserving the right to review goals, ways and means and the analysis itself.

Consensus is facilitated by the fact that deliberations are private and are supported by the Prime Minister, and that different participants are involved depending on the agenda. Another advantage is that the approach is forward-looking, rather than retrospective or focused on the present and, as a result, government representatives tend to be less defensive. As mentioned previously, the recommendations, which NESC publishes every three years, are based on broad principles and are not mandatory for the government's medium-to-long-term socio-economic policies and programmes. Nevertheless, the strategic NESC reports have been the basic input for the negotiation of the socio-economic programmes of the social pact implemented by the Office of the Prime Minister as well as a very influential guideline in the preparation of the National Plan.

Lastly, it must be recalled that the positive results of NESC and its methodology are the outcome of a long process based on "trial and error", stemming from the public sector's decision decades ago to provide the interested social groups with a neutral, high-level tripartite forum with quality technical support for discussing in private, and with the Prime Minister's support, views on the direction of the country's development.

Source: D. O'Donovan, "Public-Private Partnerships for Innovation and Export Development: The Irish Model of Development", Santiago, Chile, Economic Commission for Latin America and the Caribbean (ECLAC), 2008, unpublished.

Consensus reached thanks to collective action offers the above-mentioned advantages, but may also engender certain risks such as rigidity with respect to strategies and programmes.[25] However, in terms of an effective strategic evaluation of the environment in a country and avoiding "lock-in", NESC seems to meet the criteria described by the Australian expert, Marsh (2006), in a more general analysis of consensus-building: (i) a capacity to stabilize existing understandings; (ii) applying mechanisms for bringing together various perspectives; (iii) an institutional framework

25 There is another type of risk in public-private collaboration, that is, "capture" of the public sector by the private sector (see section D.4).

that consistently facilitates the review and resolution of problems; (iv) an environment that transcends the boundaries between policy disciplines and the expectations of the different social partners; (v) a capacity for constructing new political coalitions and networks.

More durable consensus-building for strategy formulation, for example in Ireland and Finland (and Malaysia and Singapore in terms of public understanding) calls for social cohesion as an integral part of the process, which is important for the full incorporation of civil society.

Consensus-building is not a simple matter. Nevertheless, one useful mechanism in the effort to arrive at a social consensus on a medium- or long-term national strategy to strengthen integration with the world economy and structural change can be to organize, for this purpose, high-level forums and meetings of public- and private-sector representatives that are to some degree isolated from the everyday struggle of politics and are supported by facts.

C. Institutional framework for strategy formulation and implementation

The nature of medium- and long-term strategies (and the alliances that support them) has already been examined. In addition to an alliance between the public and private sectors, the effective implementation of a strategy requires a proactive and skilled government partner that operates in an institutional framework aligned with both the scope of the strategy and its priorities. An analysis of the experiences of the selected countries reveals other "first principles" which refer to this capacity and an effective institutional framework.

1. Principles relating to the agencies that formulate and execute the strategies

Third principle

> *A strategy whose focus transcends the macroeconomic dimension and places emphasis on goals, proactive programmes and incentives designed to achieve structural and micro-economic change —such as direct support activities geared to export development— must be managed by specialized authorities responsible for the sectors and activities in the real economy. Such authorities —belonging to ministries and agencies— must have the political power, skill and technical credibility to mobilize and manage sufficient resources from the national budget in support of such a strategy, as well as effective instruments for its implementation.*

While the Ministry of Finance has an important role to play, management must be in the hands of agencies with other spheres of competence.[26] Nevertheless, the participation of the Ministry of Finance in the preparation of a strategy is important because, apart from managing vital areas of the economy and having considerable weight in government administration, it ensures the protection of fundamental macroeconomic balances while allocating resources requested by the ministries responsible for strategy execution.[27]

In countries whose strategies have a relatively well-defined structural approach, the process is controlled by one or two ministries related to the real sector of the economy. As observed in table VI.12, in most cases, those mainly responsible for the strategy are the powerful ministries of industry and trade, education, science and technology, or a special agency or entity appointed by the ministry for this purpose.

[26] Although the Ministry of Finance is a very important authority in a country, it is not the most appropriate entity for assuming this task, as its prime responsibility is to protect macroeconomic equilibria, coordinate spending, maintain the solvency of financial services, determine tax policies, and so forth.

[27] In Ireland, the Ministry of Finance coordinates other ministries and leads the public consultation on the strategy.

Table VI.12
POLITICAL ENTITIES RESPONSIBLE FOR THE STRATEGY OF STRUCTURAL CHANGE AND PRODUCTIVITY GROWTH

Country	Design and implementation agencies
Czech Republic	Ministry of Industry and Trade (MIT) Research and Development Council (STPC)
Finland	Science and Technology Policy Council of Finland Ministry of Industry and Trade (MIT)
Ireland	Department of Enterprise, Trade and Employment (DETE)-Forfás
Malaysia	Ministry of International Trade and Industry (MITI) Ministry of Science, Technology and Innovation (MOSTI) Economic Planning Unit (EPU)
Republic of Korea (up to 1993)	Economic Planning Board (EPB)
Republic of Korea (post 1993)	National Science and Technology Council (NSTC) Ministry of Science and Technology (MOST)
Singapore	Economic Development Board (EDB) Research, Innovation and Enterprise Council (RIEC) National Research Foundation (NRF)

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of official information from countries.

The power of these entities depends on several factors of varying significance: First, it is vital for the strategy to be based on the broadest possible consensus (or understanding), especially in terms of key issues for the country's development (such as integration into the world economy and export development). Second, there should ideally be an institution with recognized authority to manage such a strategy. One good example is the Department of Enterprise, Trade and Employment (DETE) in Ireland, whose agencies include Forfás, which is a sort of think tank that is highly influential in analyses of the strategy for insertion into the world economy. Third, support must be forthcoming from the highest level of government for priority strategic initiatives headed up by ministries or government agencies. This political signal can provide access to resources and can focus the actions of specialized agencies around strategic priorities (see box VI.3). Another factor that determines the power of entities implementing such strategies is the appointment of politically and/or technically renowned directors. This has been the practice in, among others, Singapore (both in the Economic Development Board (EDB) and the Agency for Science, Technology and Research (A*STAR), Malaysia (in the Ministry of Industry and Trade (MIT)) and the Czech Republic (in the CzechInvest agency up to 2007). One final determining factor in the power of the strategy-implementation authority is whether financial and human resources are allocated in accordance with the relevant mandates.

Lastly, attention from the highest political echelons and an extremely well-respected person at the helm are no guarantee that the power of the public agency implementing priority strategies will be sustained in the medium or long term. Such longevity requires any priority to become institutionally entrenched through public consensus or understanding around its value for economic development. In other words, initiatives and bodies that rely exclusively on political power or individual public figures can easily lose their legitimacy and drive, even if they are successful. This phenomenon appears to explain the fate of CzechInvest (see box VI.3) and Vision 2020 in Malaysia. A subnational experience of this kind involved a major hydrocarbon innovation strategy in the Province of Alberta, Canada (see box VI.4).

Box VI.3

POLITICAL ATTENTION AT THE HIGHEST LEVEL AS THE DRIVING FORCE BEHIND PRIORITY INITIATIVES

Czech Republic

The Research and Development Council, which is made up of prestigious members of the scientific community, advises the government and is highly influential in the formulation of research, development and innovation strategies. Since 2007, as a reflection of the new government priority, the Council has been chaired by the Prime Minister. The country used to have a very effective and influential agency called CzechInvest, which was responsible for two crucial aspects of recent strategy: FDI attraction and local business development. Last year, CzechInvest (part of the Ministry of Industry and Trade) was affected by a political disagreement within that Ministry that precipitated an internal crisis. Some commentators have remarked that the agency could have avoided such problems if it had had a more direct link with the Prime Minister (Benacek, 2007).

Finland

Innovation is central to national plans, and the body that formulates strategy and suggests the allocation of resources is the Science and Technology Policy Council of Finland (STPC). The Council is chaired by the Prime Minister.

Ireland

In Ireland, there is also new strategic impetus in the area of research and development and innovation. The Inter-Departmental Subcommittee on Science, Technology and Innovation receives reports from the Advisory Council for Science, Technology and Innovation (ACSTI), which is made up of nationally renowned technical experts and academics. Along with contributions from the Chief Scientific Adviser to the Irish Government, the Subcommittee formulates strategy and defines relevant programmes. The Prime Minister participates in the Subcommittee, which comes under the Department of Enterprise, Trade and Employment (DETE). DETE is in charge of a series of agencies (Enterprise Ireland, Industrial Development Agency –Ireland (IDA) and Science Foundation Ireland), which in turn manage a large proportion of the total public-sector budget for research and development (8.2 billion euros in 2007-2013) and for support for export-oriented innovation. DETE is also in charge of Forfás, which is a highly influential think-tank agency that produces studies for the Inter-Departmental Committee on Science, Technology and Innovation and the Advisory Council for Science, Technology and Innovation (ACSTI), while also providing major technical contributions for the formulation of national strategy and the four strategic orientations for integration with the world economy. All of the above makes DETE a leader in the field.

Malaysia

In its most recent national plans, ICT development has been the country's new top priority strategy area. The Implementation Council (ICM) has been the most senior governmental decision-making body in the field and is chaired by the Prime Minister. The initiative focuses on the development of a multimedia corridor managed by an agency of the Ministry of Science, Technology and Innovation (MOSTI). The Prime Minister also appoints the members of a very high-level International Council of Experts who advise on sectoral strategy. The Economic Planning Unit (EPU) is a technical body responsible for formulating the National Plan in consultation with Ministries. The power and legitimacy of the EPU is strengthened by its position within the Office of the Prime Minister.

Republic of Korea

The country's strategy is increasingly geared towards innovation. In 1999, the National Science and Technology Council (NSTC) was created with maximum power to define strategies, programmes and allocate resources. The Council is made up of representatives of some ministries, plus nine representatives from the scientific community, and is chaired by the country's President. In 2004, the Minister for Science and Technology was promoted to Deputy Prime Minister. The Ministry in question, the Ministry of Science and Technology (MOST), is responsible for plans and the coordination of all science and technology programmes. Lastly, some of the most prestigious public research centres working in areas of strategic priority are sponsored by the Prime Minister.

Singapore

The focus of the country's national strategy has shifted towards a new priority: knowledge creation and innovation. This is currently led by the Research, Innovation and Enterprise Council (RIEC), which is chaired by the Prime Minister, and the National Research Foundation (NRF), which was recently set up under the umbrella of RIEC and whose Director is the Deputy Prime Minister. The NRF has replaced the Agency for Science, Technology and Research (A*STAR) as strategy leader, with the latter disposing of more resources but less political representation. The NRF was allocated US$ 5 billion of the US$ 13.5 billion budget for public-sector research and development for the period 2006-2010.

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of official information.

Box VI.4

ALBERTA OIL SANDS TECHNOLOGY AND RESEARCH AUTHORITY (AOSTRA): LEADING INNOVATION TO EXPLOIT OIL SANDS IN THE PROVINCE OF ALBERTA, CANADA

The Province of Alberta, Canada, is home to one of the world's largest petroleum reserves. They are difficult to extract, however, as they are trapped in sticky layers of sediment known as oil sands. Of the total reserves, 80% has to be drilled in situ, which requires highly sophisticated technology.

The premier of the province at the time made a key contribution to the creation and promotion of the Alberta Oil Sands Technology and Research Authority (AOSTRA) in 1974 to promote the costly technological development needed to extract the oil and ensure benefits for the local population. AOSTRA was set up and run by an independent board, with the main aim of developing commercial technologies that would enable the oil sands to be exploited in situ. At least one of the board members was a political representative, while the remaining members (including the Chair and Vice-Chair) were private-sector technical experts recruited through competitive processes. Within this set-up, the presence of the political representative was an essential strategic link between the objectives of AOSTRA and the world of politics. Similarly decisive for the future of the organization was the election of a highly experienced and respected engineer from the region's private oil sector as Chair of the board. He was the only board member to be employed full time.

Even when AOSTRA was operating independently of political interests, the premier mobilized C$ 235 million to co-finance the initiative (around 50% of the funding requirements) and to attract research projects with industry partners. He also introduced one the most striking characteristics of the new organization: the rights on the new technologies developed remained the property of the provincial government. This meant that the private-sector enterprises involved only had the right to use the inventions in their place of operation but not to commercialize them. Any companies that did not collaborate would have to buy the technology at a price reflecting its development costs. Information on new inventions would be kept for 35 years. In the early stages of AOSTRA, this was the main bone of contention between the provincial government and the industry. Although only one company accepted this requirement at first, the rest of the industry eventually followed suit.

For the first two years, AOSTRA undertook a process of consultation with industry and academia. It then devised a medium-term programme of work for the first five years, which consisted of collaborating with industry to field-test the most advanced technologies developed by the private sector at that time. Devising the Underground Testing Facility (UTF) and developing and commercializing the system of Steam Assisted Gravity Drainage (SAGD) was costly and discouraging. At the same time, international oil prices collapsed in 1982 and the private sector pulled out. The provincial government maintained its long-term vision of innovation and the sector's profitability and decided to continue to implement the UTF alone. The UTF opened in 1987 and, in 1993, AOSTRA announced that it was about to overcome the obstacles to commercializing SAGD. Furthermore, over 100 patents or invention requests/reports had been produced in support of commercial licences.

The AOSTRA vision, however, began to fade in the second half of the 1980s. Peter Lougheed, who had been the main promoter of the initiative, left office. Clem Bowman also departed after 10 years. This coincided with economic problems at the national level. In this context, AOSTRA lost its political and financial independence and was eventually replaced by an agency of the Ministry of Energy.

The factors to be gleaned from this experience include the importance of political leadership; ambitious initiatives, especially in the sphere of technology, need long-term vision to be brought to fruition; when technological development costs are high and the results uncertain, funding must be long term and independent of electoral cycles; implementing agencies should be semi-autonomous with mainly technical staff and subject to the proper checks and balances; an alliance between academia and science/industry is vital; and the need to establish a long-term vision by building consensus and institutional agreements that transcend political cycles.

Source: Annette Hester, "The Canadian Experience: A Sub-National Public Private Strategic Alliance, The Case of Alberta and the Oil Sands", Santiago, Chile, Economic Commission for Latin America and the Caribbean (ECLAC), 2008, unpublished.

Fourth principle

It is vital to have analytical tools to help prepare future scenarios as a means of anticipating economic trends and supporting the formulation of national strategies in the context of public-private alliances.

Prospective analysis is a tool used to formulate strategies and plan activities. It consists of a systematic analysis of possible future scenarios, so that governments will be better able to develop related policy responses. It also has the advantage of providing a structured platform for a broad discussion of the future that can involve a maximum number of actors. The process helps to detect weaknesses, opportunities and challenges, while also building a common understanding of the most important factors. These systematic efforts provide a roadmap for progress in different areas such as developing new markets or protecting existing ones and defining priorities for science, technology, innovation, the development of labour supply and skills required by the market, demographics, environment, and so on, all with the same aim of improving the standard of living of the population.

Although prospective analysis organizes reflection on the future direction of the economy, in areas such as technological development, changes happen so quickly that studies carried out will need to be frequently updated between the periodically planned exercises, while the authorities also need to have a strong capacity for foresight and adaptation in the face of change. In other words, prospective studies should not create rigidity in the authorities' reactions to new events. The information and analysis contained in prospective studies carried out in more developed countries can be helpful too.

In most of the countries selected, prospective analysis is being implemented in an increasingly systematic and formal way by stable agencies responsible for carrying out the analysis and maintaining a constant dialogue with the authorities in terms of defining strategies and policies to face the future. As part of this process, governments have applied prospective analysis to many areas in various ways. Some countries use the methodology through agencies working in specific areas, such as prospective technological studies. In Finland, for example, prospective analysis was first used by the Finnish Funding Agency for Technology and Innovation (TEKES) to formulate its technological strategy and guide the technology programmes for which it is responsible. Since 2001, this has been coordinated by the Ministry of Trade and Industry, and its results are used by the Science and Technology Policy Council to formulate the national innovation strategy (see box VI.5).

2

Box VI.5

PROSPECTIVE ANALYSIS IN FINLAND

The process of prospective analysis has been developed in Finland since the 1990s as a way of creating public consensus around possible scenarios and prioritizing strategies in various areas of the Finnish economy. Technological prospection exercises in particular began in the mid-1990s, with a joint study carried out with France, Germany, Japan, Sweden, United Kingdom and the United States. It then became clear that prospection was a fundamental tool for formulating strategies and policies. Accordingly, the Finnish Funding Agency for Technology and Innovation (TEKES) has used prospective analysis for its future planning and to support prospective projects focusing on technological matters. The process has benefited from the association between various actors and experience-based learning.

At present, technological prospection is coordinated by the Ministry of Trade and Industry. In 2001, the Ministry began the process by coordinating a project to analyse future scenarios and visions for innovation policy, track the development of various processes and develop new focuses for long-term analysis. The process also resulted in the establishment of several networks of experts and ministers and an administrative committee with representatives from the Ministry of Trade and Industry, TEKES and the Technical Research Centre of Finland (VTT).

In 2005, TEKES and the Academy of Finland launched a joint prospection project called Finnsight 2015. The aim was to identify future competencies in the fields of science and technology, society, business and industry, and then to prioritize them. The project was an aid in identifying the country's centres of excellence in science, technology and innovation, in keeping with the government's decision to develop the public research system, mainly for the purposes of export development. The project also strengthened relations between TEKES and the Academy of Finland and created a climate of multidisciplinary discussion. The prospective analysis was carried out by panels of leading industry experts and researchers who provided their multidisciplinary knowledge and experience and informed the panels about the work of their respective networks. Discussions were constructive and each panel produced its own report, which were all summarized in the publication of the report Finnsight 2015.

In 2006 TEKES launched the Signals 2006 prospection project, which was focused on industry and society. The project partners included, inter alia, the Ministry of Industry and Trade, the export credit agency Finnvera, the Finnish Innovation Fund (Sitra), the Academy of Finland and the Technical Research Centre of Finland (VTT). The project aimed to discover new opportunities and challenges. For the Government, such an exercise facilitates the decision-making process in what is a constantly changing environment. The project also helps TEKES to define its strategy and the orientation of its technological programmes. The process involved recruiting 7,000 people and requesting the collaboration of foreign parties to carry out benchmarking in relation to the country's innovation environment, opportunities and challenges.

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of TEKES/Academy of Finland, "Finnsight 2015: The Outlook for Science, Technology and Society", September 2006; Raimo Pulkkinen, "Finnish Manufacturing Foresight Exercise", TEKES, 2000; Ahola Elija, "Technology Foresight within the Finnish Innovation System, TEKES, Finland", February 2003; and TEKES, "Signals 2006" [online] http://www.tekes.fi/eng/innovation/foresight.htm.

Other countries have centres of prospective studies, but they have no more than an informal relationship with government bodies. Such is the case of Sweden, where high-level prospective agencies (like the Institute for Futures Studies, Royal Swedish Academy of Sciences, Swedish National Board for Industrial and Technical Development, Swedish Foundation for Strategic Research and the Swedish Industry Association) act independently in terms of choosing their agenda, experts, working methods, funding and the conclusion of their reports (Paillard, 2005; Lübeck 2001). However, agencies expect the government to take their analysis into account, and their studies have indeed had a very significant impact. They have become an important tool for the Swedish government by: contributing to public debate and alerting the population to future challenges; using prospective analysis as a means of consultation on social reform; and helping to define strategic priorities (especially in the realm of science and technology).

Lastly, there are countries that have been making efforts to undertake prospective studies, and some have created government agencies for that purpose. However, these agencies have not been able to generate much of an impact owing to the dominance of a short-term focus in government decision-making.[28]

Fifth principle

In strategy implementation, it is important for each priority area or activity to have one or more dedicated implementing agencies to support the private sector in the achievement of objectives. However, a balance must be struck between the dispersion of specialization and the demands of coordination.

As shown in table VI.13, the selected countries have a range of main agencies that are working in the four strategic areas of integration with the world economy and export development. The institutional structure of these agencies is, however, dynamic and functional, i.e., adapted to the evolution and priority content of the strategies in question. In Ireland and Singapore, for example, one large institution (the Industrial Development Agency (IDA) and the Economic Development Board (EDB), respectively) covered all four strategic areas. However, economic progress and a desire for structurally specific strategies resulted in the creation of agencies specialized in each area. This displayed a kind of Tinbergen's Rule,[29] with each main function covered by a clearly identified agency.[30]

Sixth principle

The more structured and specific a strategy is, the greater the need for coordination among ministries and agencies. In that context, it might be necessary to use instruments of coordination that go beyond those used at the cabinet level. This is even more relevant if central and subnational governments are introducing measures in parallel, or if the economy is complex and/or geographically disperse.

Having institutions with their own clear mandate limits the risks of duplication of efforts and tensions over the territorial distribution of tasks. In any event, collaboration and coordination are always required. For instance, the Industrial Development Agency (IDA) of Ireland must coordinate with Enterprise Ireland (EI) on FDI attraction programmes that often stipulate linkages with local suppliers. Ireland has several mechanisms for facilitating coordination. The role of coordinating the country's agencies described in table VI.13 is assigned to Forfás, and they all come under the

[28] For example, in Australia the first prospective analysis agency was created in 1985: the Australian Commission for the Future, although its significance and budget decreased as the years went by. Then in the 1990s, the Australian Science, Technology and Engineering Council (ASTEC) that had been set up in 1979 to advise the government on science and technology policy, became geared to anticipating the future by applying a long-term prospective analysis in the late 1990s. Its proposals, however, did not have much impact. There are other public agencies in Australia carrying out prospective analysis, but again they have had little nationwide impact. See James (2001), Tegart (1999) and Conway and Stewart (2004).

[29] Whereby each objective requires its own instrument.

[30] Ireland combines export development with the business development of SMEs in one agency, as multinationals do not need export support. Singapore keeps the two areas of responsibility separate.

Department of Enterprise, Trade and Employment (DETE). The authority of Forfás is strengthened by its renown as a strategic institution and its influence in terms of budget allocation.

Table VI.13
MAIN AGENCIES IMPLEMENTING PROGRAMMES AND POLICIES IN THE AREA OF INTEGRATION WITH THE WORLD ECONOMY

	Attraction of FDI	Internationalization of SMEs	Export promotion	Innovation
Australia	AUSTRADE (part of the Department for Foreign Affairs and Trade)	Various	AUSTRADE	Various
Czech Republic	CZECHINVEST	CZECHINVEST	CZECH TRADE	Various
Finland	Invest in Finland	…	Ministry of Foreign Affairs/FINPRO	Academy of Finland, TEKES
Ireland	Industrial Development Agency (IDA)	Enterprise Ireland (EI)		Science Foundation Ireland (SFI)
Malaysia	MIDA	Various	MATRADE	Various
New Zealand	NZ Trade and Enterprise (through Invest New Zealand)	NZ Trade and Enterprise		Various
Republic of Korea	Korea Trade-Investment Promotion Agency (KOTRA)	Various	KOTRA	Various
Spain	Autonomous Communities	Central export promotion agency (ICEX) and Autonomous Communities	ICEX and Autonomous Communities	Centre for the Development of Industrial Technology (CTDI) and Autonomous Communities
Singapore	Economic Development Board (EDB)	Standards, Productivity and Innovation Board (SPRING Singapore)	International Singapore	A*STAR, Economic Development Board
Sweden	Invest in Sweden Agency (ISA)	National Board for Industrial and Technical Development (NUTEK)	Swedish Trade Council	Swedish Research Council (VR), Swedish Governmental Agency for Innovation Systems (VINNOVA)

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of official information from countries.

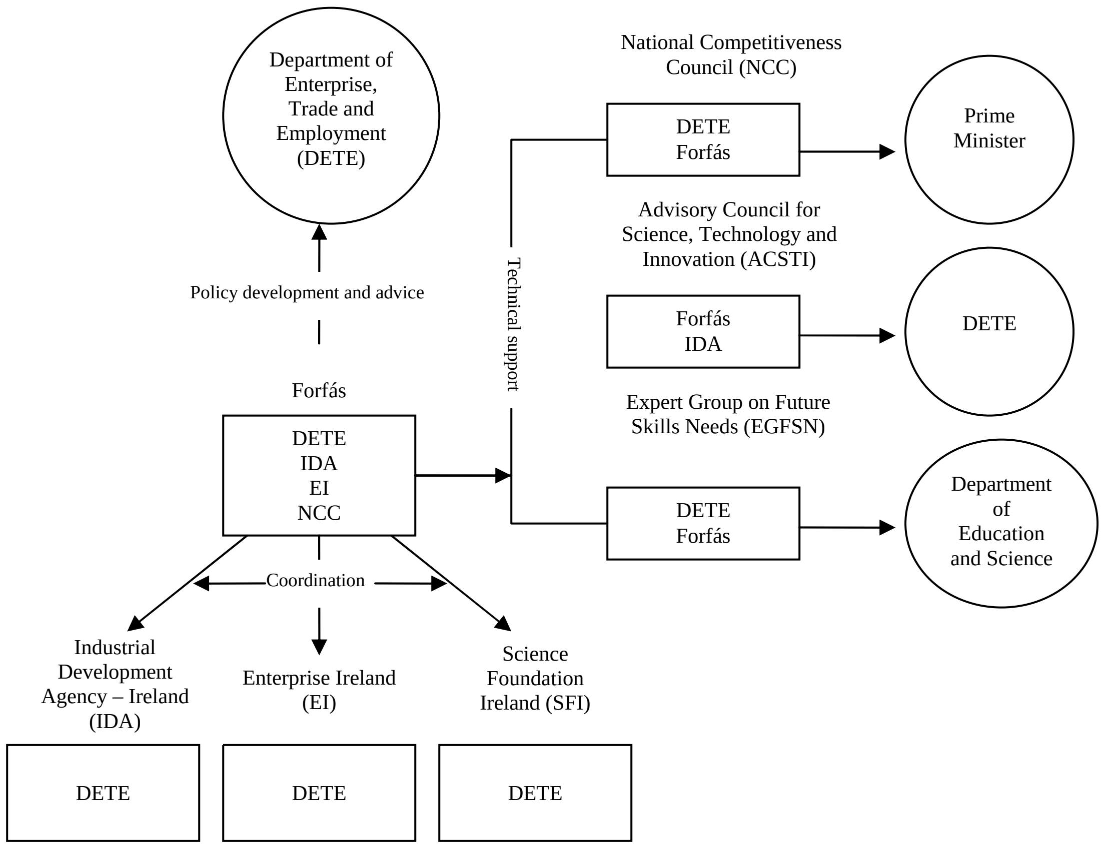
Note: One common characteristic in export promotion not included in the table is that there are often other export insurance and credit agencies.

Both the public boards of directors of public agencies and committees involved in strengthening integration with the world economy and export development include many representatives of various public-sector agencies (as well as private-sector representatives), although there is always a cross representation of Forfás and DETE (see figure VI.7).

Assessment of the performance of agency officials makes reference to internal coordination and external coordination with other agencies. The buildings of Forfás, IDA, EI and SFI are in the same complex, thereby facilitating informal day-to-day communication.

Figure VI.7

IRELAND: CROSS REPRESENTATION ON THE BOARDS OF DIRECTORS AND COUNCILS OF BODIES IMPLEMENTING THE EXPORT DEVELOPMENT STRATEGY [a]



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of official documents from Ireland.

[a] Each box also represents board members of the public and private sectors who are not indicated in the figure. The only board member representation presented inside the boxes of the figure are those which are repeated in one or more agencies or bodies at the same time.

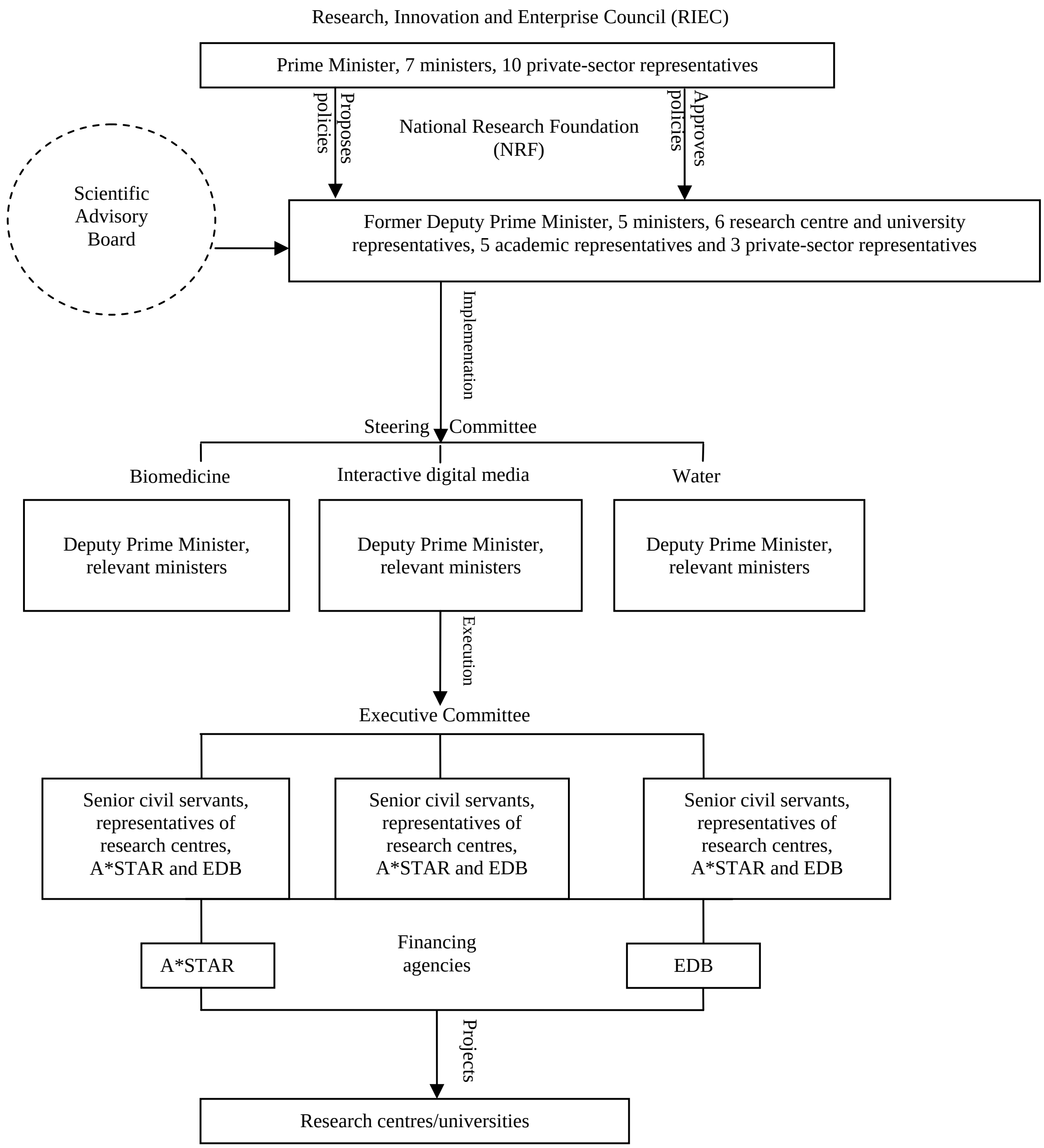
In Singapore, although there is some cross representation on boards, much of the coordination takes place through structured committees and informal networks within a stable cadre of professional civil servants who have worked together for a long time in the various agencies and bodies. Figure VI.8 illustrates the formal network of coordination among committees and agencies responsible for promoting R&D and innovation (as well as their members). There is a noticeable specialization of approach the nearer a decision gets to the final disbursement of resources to beneficiaries.

The strategy of Finland is focused on innovation. Coordination is facilitated by the strategy's strong degree of focus and thanks to clear mandates as part of a simple division of labour between the Finnish Funding Agency for Technology and Innovation (TEKES) (which drives applied research) and the Academy of Finland (which promotes basic research). Furthermore, each agency submits annual plans (with periodic monitoring of results) to the appropriate ministry for execution of the courses of action recommended in the three-year national plan devised by the alliance represented on the Science and Technology Policy Council (mentioned in section III). Figure VI.9 summarizes coordination in Finland.

In Malaysia, the agencies are conventionally coordinated by the relevant ministries and through regular interministerial coordination meetings involving the Prime Minster as ultimate arbitrator. In the area of SMEs, in addition to the Small and Medium Industries Development

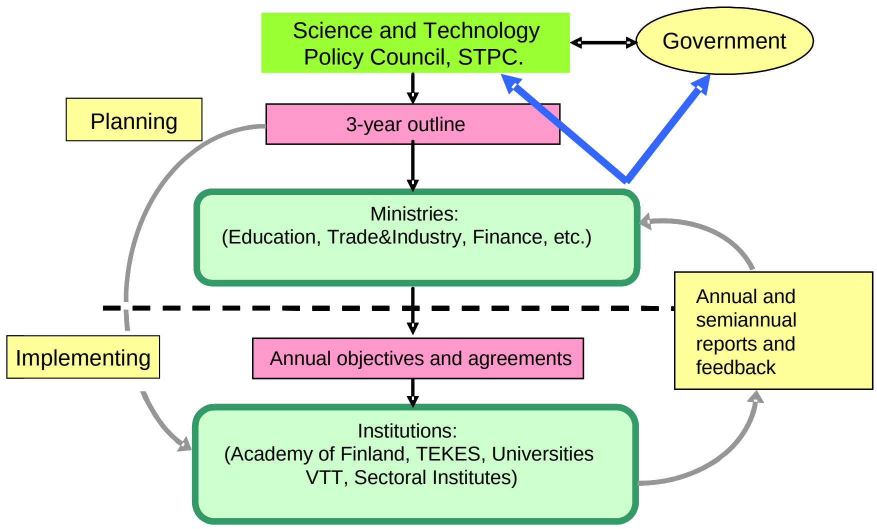
Corporation (SMIDEC), there are also over 12 ministries and 38 agencies charged with implementing strategic lines related to SMEs. Each agency has explicit objectives identified in national strategies. This in itself is a coordination mechanism. However, the National SME Development Council (NSDC), a dedicated inter-ministerial committee, was set up to improve coordination.

Figure VI.8
SINGAPORE: COORDINATION OF INNOVATION INSTITUTIONS



Source: Economic Commission for Latin America and the Caribbean (ECLAC), based on S. Kumar and S. Siddique, "The Singapore Success Story: Public-Business Sector Alliance for Investment Attraction, Innovation and Export Development", Santiago, Chile, 2008, unpublished, and official data.

Figure VI.9
FINLAND: PLANNING AND COORDINATION AMONG AGENCIES



Source: International Organisation for Knowledge Economy and Enterprise Development (IKED), "Building Long Term Strategies and Public-Private Alliances for Export Development: The Finnish Case", Santiago, Chile, Economic Commission for Latin America and the Caribbean (ECLAC), 2008, unpublished.

The Czech Republic has an implementation and coordination system for the achievement of strategic objectives assigned to a ministry or agencies within a ministry. In the first half of 2006, the Czech Council on Trade and Investment was set up to coordinate agencies in these areas. However, the Council had not become operational by 2007. The fact that there is a new government coalition means there is a risk of fragmentation of tasks. The discussion on the need to centralize the agencies executing the innovation plan, rather than relying on 22 ministerial channels, suggests that coordination in this area is going through a difficult time.[31]

Since national planning was abandoned in the Republic of Korea, each ministry devises its own plan. Initiatives to create new coordination mechanisms within a complex State apparatus and sophisticated economy have not always been successful. In terms of support for research and development and innovation, organization is especially fragmented, which in turn results in a duplication of efforts and bureaucratic tensions.

New Zealand implements its strategy through a small number of agencies with a wide range of policies and programmes. This reflects the fact that the current economic transformation strategy is somewhat path-dependent on the relatively horizontal strategy of the past, which makes it difficult to implement a more structurally oriented strategy. Agency coordination is carried out through a lead ministry. The strategy is formulated by the Ministry of Economic Development, which uses interministerial committees as part of the official framework intended to promote an integrated government. As in Ireland and Singapore, some specialized bodies have cross representation on boards of directors.

Australia, Sweden and Spain are facing serious coordination challenges. In Spain, implementation responsibilities are relatively easy to assign and coordinate, thanks to a strategic approach that, until recently, was fairly horizontal in terms of export development. Serious shortcomings have, however, arisen in terms of coordination between the Central Government and the Autonomous Communities, which have a fairly high degree of independence as far strategies

[31] Nonetheless, the programming requirement for the use of European funding is a positive factor in the coordination of strategies relating to integration with the world economy and export development.

and implementation are concerned (see box VI.6 on the case of Andalusia). In an effort to improve coordination, ICEX (the central government export promotion agency) recently joined the board of its counterpart agency in Andalusia (Extenda).

Box VI.6

THE AUTONOMOUS COMMUNITY OF ANDALUSIA: A SUBNATIONAL CASE

Since 2003, the Autonomous Community of Andalusia has been implementing a development strategy known as the Second Modernization of Andalusia. Export promotion, FDI attraction, industrialization of SMEs and innovation are the central hubs of this strategy. The resulting programmes and policies are implemented by two agencies: the Trade Promotion Agency of Andalusia (Extenda) which focuses on traditional export promotion activities, and the Innovation and Development Agency of Andalusia (IDEA), which deals with the other areas of export development.

The relationship between the public sector (agency executives) and the private sector (associations and chambers of commerce) has been a smooth and easy one, irrespective of the political party in office, with no serious differences of opinion between the two sectors. There is an unwritten understanding about their roles and how to interrelate, with the public sector systematically consulting the main private organizations on issues of internationalization policy and, albeit to a lesser degree, on support for SMEs and innovation. The execution of promotion policies is decidedly sectoral. Private associations and organizations play a very active role in the design and execution of policies and plans. There are also frequent meetings (especially informal ones) between the sectors.

In recent years, this relationship has become increasingly formal. One example is the admission of business organization representatives into the Export Promotion Institutions of the Autonomous Communities.

The capital of Extenda is 88% owned by the government of Andalusia, with the remainder owned by 12 of the region’s 14 Chambers of Commerce. The government has limited involvement in the day-to-day running of Extenda, its strategic positioning and the design of instruments and programmes, which are defined by the Management Board. The Board has 12 members, of whom 10 represent various public administration bodies. These include ICEX (the central government export promotion agency), and a formal policy-coordination link is being forged between the two. The two remaining members of the Management Board are elected by the Chambers of Commerce of Andalusia.

The government has guaranteed increasing levels of minimum budgetary income over time, and this has enabled Extenda to plan in the medium and long terms. Another contributing factor to this has been the fact that its instruments have mainly been those with low budgetary requirements yet maximum visibility in terms of being close to businesses needs: information, training, advice, promotion and support abroad. Extenda often carries out surveys and studies on the value of its business services, and the results point to a very high level of satisfaction with the services offered. In contrast to ICEX, since 1998 the Extenda promotion programmes are part of the agency’s multi-year strategic plans. The plan currently being implemented is for the period 2007-2010. Strategic plans are produced by an external consultancy firm with the input of Extenda and then reviewed and presented to the Managing Board for discussion and approval. IDEA has an Advisory Board made up of representatives of the Community’s socioeconomic agents. The agency has a Strategic Support Plan 2005-2008 based on the objectives included in the Innovation and Modernization Plan of Andalusia 2005-2010. Community plans are subject to consultation as part of social cohesion accords.

The Autonomous Communities, and Andalusia in particular, are assuming growing responsibilities in developing their business networks and boosting cooperation between government and the private sector. The fact that regional administrations are closer to local companies means they find it easier than the central government to understand their needs. This means they have a key role to play in innovation and research and development. However, autonomous administrations have similar problems to the central government: slow and bureaucratic management, limited coordination with other bodies of the central government and within the region, etc. In the case of Andalusia, the regional government’s autonomy and room for manoeuvre in the design and implementation of innovation and SME support policies has been influenced by European Union practices in this area.

To a certain extent, the Autonomous Community of Andalusia could be said to have a higher level of institutional development than the central government, as the former has a medium-term strategy based on a guiding public-private partnership, thereby driving the institutional reform needed to strengthen programme and policy coordination, all with a view to achieving more integral growth for the region.

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of A. Bonet Madurga, “Partenariados público-privados: fomento de la exportación e innovación en pymes. El caso de España”, Santiago, Chile, Economic Commission for Latin America and the Caribbean (ECLAC), 2008, unpublished.

Despite the fact that Australia has a relatively horizontal development strategy, it is much more structured in the area of innovation strategy, an area that covers multiple sectors and activities. Implementation has therefore been fairly spread out among specialized agencies and ministries. Although this could be interpreted as leaning towards a system of "open innovation" (a broad network of informal relations between agents contributing to innovation), it also creates a huge demand for effective coordination mechanisms. In the current system, ministries and specialized agencies operate without much interaction, thereby creating a series of "silos", which hampers the development of integrated management (see figure VI.10).[32] Second, like Spain and its relations with the autonomous communities in the country, Australia faces the challenge of aligning federal government programmes and state programmes. This is further complicated by the geographical dispersion of Australia.[33]

Seventh principle

> *For medium- and long-term strategies to be effective, executing agencies must not be politicized. Their staff should be professional, technically competent and relatively stable. This is the only way that agencies can serve as the "technical arm of the strategy", both in terms of developing inputs for strategies and implementing them with the professionalism and credibility needed to work with the private sector.*

There are two prevailing management models in the countries selected. In the first model, specialized agencies are directly controlled by the central government. This system is in place in the Czech Republic, Finland, the Republic of Korea and Sweden. In the second model, agencies are semi-autonomous, with legally delegated mandates, and operate at "arm's length" from the executive (often as a statutory body). This is the case in countries with a commonwealth tradition (Australia, Ireland, Malaysia, New Zealand and Singapore) and also in Spain.

In the first model, semi-autonomy from political cycles (and certain operational aspects) may arise from historical convention, as in Finland. However, CzechInvest (responsible for FDI attraction and SME development strategy) enjoyed almost 15 years of relative autonomy based on the professional excellence of its executive directors, team and management, but was unable to establish a sufficiently solid tradition within the administration and public awareness. CzechInvest therefore underwent a crisis in 2007.

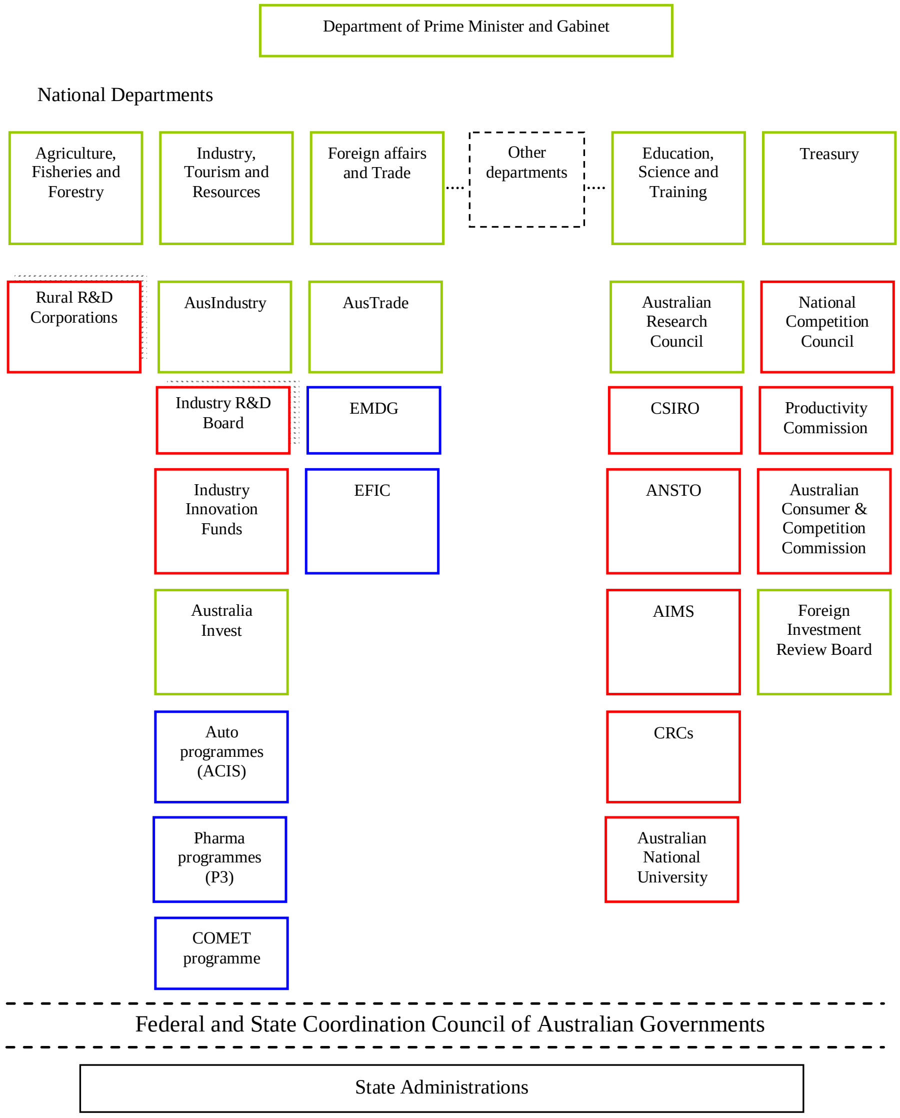
In the second model, functions are delegated more explicitly and agencies are better protected from political cycles. This system also has the advantage of raising the specialized professional profile of the agency, by giving it more flexibility than central government offices in terms of professional recruitment, salaries, procedures and the promotion of cooperation.

Such semi-autonomy may also make the agency more accountable with regard to the results of its programmes. Lastly, autonomy remains relative, as the government is represented on the board and usually appoints the directors, stipulates periods of rotation and allocates funding. Agencies are also subject to public auditing procedures.

[32] Silos also hamper processes that could lead the development of effective national strategies. According to Cutler (2008), the new Australian Government has announced its intention to strengthen coordination mechanisms within the federal system and between that system and individual states.

[33] One way of mitigating the problem of geographical dispersion would be for agencies to use regional offices more intensively. As for the gap between the federal government and individual states, coordination could be facilitated through cross representation on agency boards of directors.

Figure VI.10
ADMINISTRATIVE STRUCTURE OF MAIN INNOVATION PROGRAMMES AND AGENCIES IN AUSTRALIA



- CISRO: Common wealth Scientific and Industrial Research Organisation
- ANSTO: Australian Nuclear Science and Technology Organisation
- AIMS: Australian Institute of Marine
- CRC: Collaborative research centres
- EMDG: Export Market Development Grants
- EFIC: Export Finance and Insurance Corporation

Source: Economic Commission for Latin America and the Caribbean (ECLAC), based on T. Cutler, “Public and private sector alliances for innovation and economic development: The Australian experience”, Santiago, Chile, ECLAC, 2008, unpublished.

Note 1: Information corresponds to the situation up to December 2007.

Note 2: Boxes with a green outline indicate direct departmental or ministerial control; boxes with a red outline indicate a statutory or “arms length” agency; and boxes with a blue outline indicate programmes under departmental budgets.

Note 3: CISRO: Commonwealth Scientific and Industrial Research Organisation; ANSTO: Australian Nuclear Science and Technology Organisation; AIMS: Australian Institute of Marine Science; CRC: Collaborative research centres; EMDG: Export Market Development Grants; EFIC: Export Finance and Insurance Corporation.

It has been shown that some of the professional profile of agencies depends on their ability to recruit and retain well-trained staff. Salaries and incentives can play an important role here. In most countries, however, agency salaries are below those for equivalent work in the private sector. The exceptions to this are Ireland and Singapore, as these countries make a conscious effort to move towards equivalent salaries for the public and private sectors and maintain a quality public work force.[34] In Spain, pay in statutory agencies tends to be lower than in the private sector, but somewhat better than in central government. Malaysia and the Republic of Korea have depended more on a sense of pride and the prestige of public service to motivate workers.

In the human resource management of Singapore, corporate culture is usually encouraged in specialized agencies. Furthermore, the government pays bonuses (of between two and four months' salary) linked to the growth rate of the economy. The aim is to motivate not only individual performance but also the teamwork that is so vital for a system that implements strategy lines through a network of agencies. The government has also set up an elite body of around 250 public servantss, inspired by the French system of public management. They are recruited from the country's best students and receive academic and business training at home and abroad throughout their careers, so that they are able to technically lead the development and implementation of strategies.

2. Management of incentives

First principles abound not only in institutional organization but also in the management of programmes and incentives. This is a complex and multifaceted issue that can only be discussed fairly briefly herein.

Eighth principle

> *The effective application of incentives must be assessed not only on the basis of how they are individually managed, but also in terms of how those incentive programmes are coordinated, so that public action has a systemic and integral effect.*

A review of the way the strategy is executed in the selected countries will illustrate how the programmes and incentives operate in the four strategic orientations defined earlier (see table VI.14). In order to promote linkages between local business and the world economy, agencies implement training programmes, support enterprise and innovation and help to meet financing requirements, especially for what the authorities consider small and medium-sized enterprises (SMEs). Countries place more or less emphasis on these areas depending on their specific concerns. This emphasis is conveyed through the programmes —the different types of technical assistance, consultancy, quality of training offered and the combination of the different instruments, the most common being loans, competitive funding and different tax incentives.

The strategic area of attracting foreign investment generally consists in establishing concessionary contractual arrangements under which governments offer tax incentives for given periods, supply public financing for infrastructure, train the manpower needed and provide other benefits that can support the company. For its part, the company undertakes to set up operations in the country, make significant reinvestments or comply with certain goals (for example, job creation). Under other programmes, firms are encouraged to support the development of a local input supply industry and to locate part of their R&D activities in the country. Lastly, the trend now is to set up

[34] The Minister of Defence in Singapore recently made the following comments on public salaries: "We do not aim to lead private sector salaries, but we must keep pace. If we are not responsive, we will lose our ability to recruit and keep able people. This will do great harm to Singapore as we should have lost one key advantage over other countries —a clean, competent and effective civil service" (*The Straight Times*, 3 March 2007).

one-stop shops where officials of various ministries and agencies assist the foreign company during the feasibility study phase as well as during the installation and post-investment phases.

Table VI.14

TYPOLOGY OF PROGRAMMES AND INSTRUMENTS IN AREAS OF STRATEGIC ORIENTATION

	Policies, programmes and incentives	
International integration of local business	Training programmes	Subsidies for participation in specific training programmes
	Improvement of operation, management, training, adoption of new standards	Subsidies for consultancy, technical assistance, training, preparation of business plans, quality enhancement
	Support for new projects	Subsidies and competitive funds for the development of new projects
	Programmes to develop collaborative innovation	Subsidies for integration in networks and collaborative research
		Availability of consultants and R&D alert campaigns Technology transfer services
	Tax incentives	Tax discounts, exemptions, preferential rates, rebates on machinery and equipment
	Other	Subsidies, soft loans, venture capital
Export promotion	Assistance in gaining a foothold in external markets	Co-participation and loans for linkages with the global markets
		Support with the organization of country brand initiatives and fairs
		Financing for export loans and risk insurance for trade operations
		Competitive funds up to a percentage of the investment in promotion abroad
		Market alert and research offices
FDI attraction and reinvestment	Public financing	For infrastructure (buildings, technology corridors, technological cities) and training of labour and professionals for the industry in question.
	Tax incentives	For specific periods: tax discounts, exemptions, preferential rates, rebates on machinery and equipment
	Attracting R&D firms	The same tax incentives plus special competitive funding
	Other services	Creation of an “one-stop shop” with representatives from different ministries/agencies to deal with problems concerning programmes, public regulations and post-investment services
Innovation	Technical assistance	Technical assistance to companies through training in management and strategy design for innovation
		Availability of “pay-as-you-use” laboratory installations
	Promotion of innovation in key sectors	Collaborative research funds for clusters or consortia
		Collaborative funds, companies – universities, research institutes and centres of excellence
		Tax exemptions or tax credits
		Subsidies for conferences and workshops and for major researchers
	Attracting talent	Programmes for recruiting high-level researchers from abroad or collaborating with them
	Scholarships	Various scholarship funds
	Marketing of knowledge	Training in intellectual property
		Seed capital
		Investor contact networks Training in corporate management for innovation

Source: Economic Commission for Latin America and the Caribbean (ECLAC) on the basis of official documents from the respective countries.

Export promotion strategies are designed to assist firms in gaining a foothold in external markets. The types of services offered are fairly common in all countries and the difference between one and the other lies more in their effectiveness than in the programmes themselves. In most cases, some degree of subsidy is granted in ways that do not infringe the rules of the World Trade Organization (WTO).

Lastly, as regards innovation, programmes seek to promote the development of new products and services as well as new processes in industries or clusters defined by the strategy. Incentives for technical assistance in terms of management of innovation are also offered, as is assistance in the commercialization of the results of innovation. Indeed, this last aspect is becoming increasingly important, especially with regard to the creation of formal and informal networks of researchers and businesses. Besides educational initiatives, the priority instruments in this area are competitive funding and tax credits. In this respect, the question of whether direct subsidies and competitive funding are a more suitable instrument for innovation than tax credits has come up for discussion (see box VI.7). As regards international networks, countries such as Singapore and, to a lesser extent, Ireland have active programmes for recruiting internationally renowned foreign researchers to work with their local counterparts (a kind of “twinning”) in order to boost national capacity.

Box VI.7
EFFICIENCY OF TAX CREDITS FOR RESEARCH AND DEVELOPMENT

Tax credits (or concessions) for R&D have been successfully applied in countries such as Canada, the United Kingdom and the United States. They have not had the same success in less advanced countries. Studies have been carried out to compare their efficiency with that of direct subsidies in specific programmes designed to boost corporate supply and demand for R&D (Maloney and Perry, 2005).

Tax credits are said to be more useful than direct subsidies in avoiding conduct that might lead to government failures in the selection of projects. However, subsidies might be an advantage in some countries where resources are relatively scarce and where there is therefore a need to prioritize certain activities or sectors. It is also argued that tax credits benefit investments in R&D that would have been made in any event. Although subsidies theoretically support marginal projects, the difficulty of distinguishing such projects may make the distinction less relevant from a systems administration point of view. Another disadvantage of tax credit is that it does not take account of the difference between the social rate of return and the private rate of return, which may not be the same in all projects. Here again, a subsidy should be able to address such a difference, although in practice this can be difficult. Subsidies do have a clear advantage for sectors and activities that show promise but have yet to generate profits, such as in the area of start-ups or some SME sectors/clusters.

Perhaps the main problem of tax credits is the limited capacity of tax systems to absorb and administer them and their possible lack of transparency, except when there is a detailed record of the amount involved. This is especially relevant for most developing countries, which means that using subsidies instead of tax credits may facilitate governance of the system (Maloney and Perry, 2005).

The truth is that neither one option nor the other is necessarily better. In short, instead of assessing the impact of an incentive in the abstract, it is preferable to analyse the system and governance of the programme arrangement within which it operates. For example in 1989, in Australia, the tax credit was extended to a syndicated loan for projects carried out by corporate groups. This was done to encourage companies to assume much larger costs and risks that would be impossible to take on individually (Australian Taxation Office, 2004). However, concerns about abuses in the syndication led to elimination of the scheme in 1996, despite the fact that much of the increase in firms’ R&D expenditure was attributed to the syndicated projects. The administrative agency lacked transparency and accountability. In addition, a lack of knowledge and experience on the part of the institutions in corporate financial structures made it difficult to come to a decision, further limiting the award of incentives.

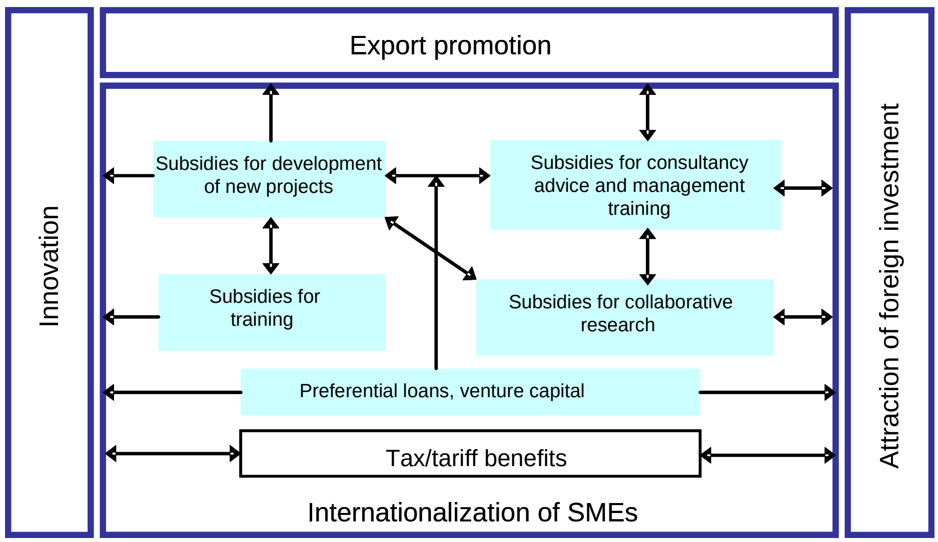
One of the problems of incentives, irrespective of the instrument used, may be that the approach adopted is too narrow. This was the case in Australia: only the direct R&D costs were taken into account in the case of a tax credit for innovation, while neglecting the costs of commercializing innovation, which tends to be extremely high, especially for small and medium-sized enterprises. Firms that benefited from the incentive ignored the commercialization aspect, so that part of the R&D did not necessarily generate value. It was therefore essential to supplement the tax credit with direct subsidy programmes for commercialization, such as “Commercialising Emerging Technologies Programme (COMET)” and the Commercial Ready Programme”; these programmes were geared to providing subsidies and support for commercializing innovation. Hence coverage involves the R&D phase, testing of the concept, technological diffusion and the early stages of commercialization.

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

Figure VI.11 illustrates how the instruments and programmes tie in with the four areas of strategic orientation on the basis of integrating SMEs into the world economy. The application of a particular incentive may fail if it is not combined with other elements necessary for the success of the whole. For example, subsidies for consultancy and management training in SMEs could be indispensable for the success of the special loans for international expansion granted by the export promotion agency. The programmes of the agency in charge of internationalization of SMEs, which promotes linkages with transnational firms or with international value chains, work together with incentives to attract foreign investment that have the potential to stimulate demand for local suppliers and services.

Figure VI.11

FUNCTIONAL LINKS BETWEEN SUPPORT PROGRAMMES: THE EXAMPLE OF SMEs

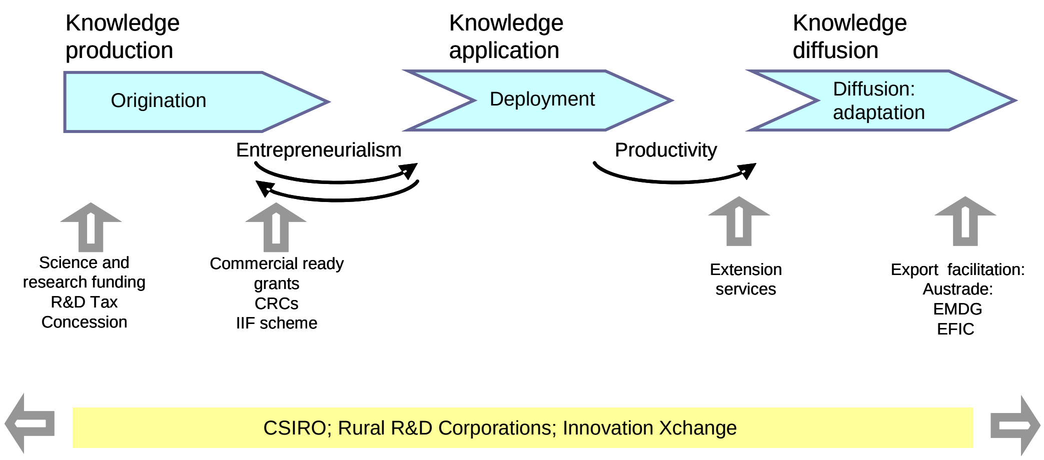


Source: Economic Commission for Latin America and the Caribbean (ECLAC).

The implementation of Malaysia's strategy is a good example of the above. One of the objectives of the Third Industrial Master Plan is to achieve stronger linkages between SMEs and the production chains headed by the transnational corporations, or integrate SMEs into the world economy. The Small and Medium Industries Development Corporation (SMIDEC) is responsible for developing programmes to achieve these objectives (SMIDEC, 2006). There are four programmes in execution: the Industrial Linkage Programme (ILP), the Global Supplier Programme (GSP), the Skills Upgrading Programme and Enterprise 50. These encompass areas in which the business needs to improve if it is to become an exporter or a supplier for transnationals. In the sphere of innovation, the Strategic Business Intelligence Centre (SIRIM) is a government agency that is part of the Ministry of Science, Technology and Education and that supports local industry through multidisciplinary technological programmes (SRIM, 2005). Its R&D programmes are geared towards new technologies and seek to bring companies to the technological frontier, transforming them into global players. The programmes provide services mainly for small and medium-sized enterprises, including strategic planning, business intelligence, technological development and quality. This set of actions complements those developed by SMIDEC to provide comprehensive assistance.

The innovation chain in Australia in figure VI.11 is another example of the need for coverage and coordination of incentives.

Figure VI.12
INTERVENTIONS IN SUPPORT OF INNOVATION: THE CASE OF AUSTRALIA



Source: T. Cutler, “Public and private sector alliances for innovation and economic development: The Australian experience”, Santiago, Chile, Economic Commission for Latin America and the Caribbean (ECLAC), 2008, unpublished.

Note: Commonwealth Scientific and Industrial Research Organisation (CSIRO), rural R&D corporations (RRDCs) and collaborative research centres (CRCs) support innovation. Austrade, EMDC and the Export Finance and Insurance Corporation (EFIC) support respectively the promotion of exports, loans and export insurance.

The figure reinforces the idea that innovation support must take into account interconnections between key activities for fulfilling the central objective, bearing in mind the primary constraints, on the one hand, and avoiding gaps in the coverage of agencies and programmes, on the other.

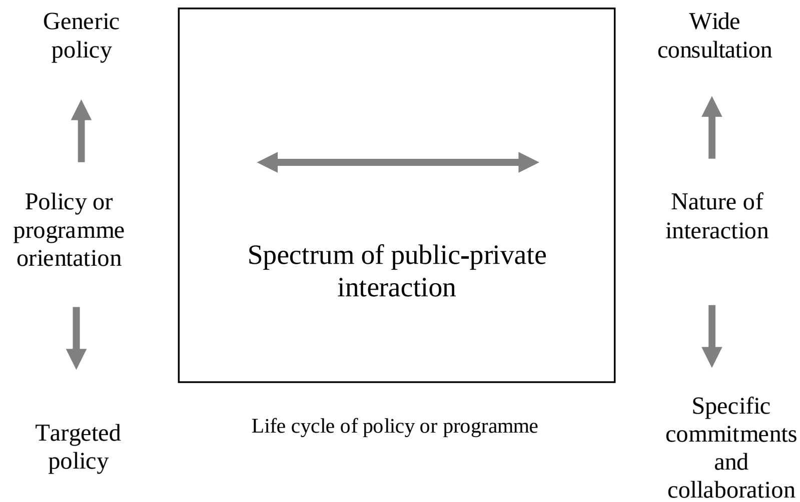
Lastly, there are differences within and between the selected countries in terms of whether they implement programmes and policies and grant incentives across the board or selectively. Some policies and programmes are applied on a general basis and any company may opt for them; these include tax rebates for attracting FDI (when the investment is ruled eligible), subsidies for investment in integrating SMEs into the world economy, and tax credits for R&D. However, there are also policies and programmes geared to clusters, selected sectors or to specific activity, with various instruments, such as sectoral investment funds or innovation investment in activities considered key for the country’s export future.

Ninth principle

> *Targeted policies increase the motivation to set up public-private alliances and also tend to increase collaboration in the design and implementation of strategic programmes.*

Figure VI.13 illustrates the relationship between the type of policy and the nature of private participation. The left axis represents policy orientation. On one extreme of the left axis is the generic or horizontal policy (with its above-mentioned across-the-board incentives). In these types of policy, interaction with the private sector tends to take the form of wide-ranging consultations in the programme design phase (this policy does not identify its beneficiaries, who therefore do not participate actively in the life cycle of the programme).

Figure VI.13
PROGRAMMES AND POLICIES AND THE NATURE OF PUBLIC-PRIVATE PARTICIPATION



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of T. Cutler, "Public and private sector alliances for innovation and economic development: the Australian experience", Santiago, Chile, Economic Commission for Latin America and the Caribbean (ECLAC), 2008, unpublished.

At the other extreme is the selective policy, geared to developing a new sector or specific activity. In such cases, the nature of public-private interaction is more active and can be more collaborative in nature, including co-investment and specific agreements by the parties, since there is greater interest in participating and setting up linkages with agencies and their programmes throughout the life cycle. The Rural R&D Corporations (RRDC) in Australia are a good example of the latter, as many are funded through joint investment by the government and the private sector, which contributes through a collective tax.

Tenth principle

The effectiveness of programmes and instruments is linked to the way in which the process is managed.

In this regard, the following experiences should be borne in mind:

(i) Incentive programmes are more likely to succeed if they correspond to industries and/or activities where the private sector already has some coordination capacity (even if only incipient).

(ii) The importance of the availability of sufficient financing for the effective implementation of programmes and policies. In many countries, there are funds or agreements covering several years for new priority initiatives, which by their nature represent long-term projects. This helps to increase the credibility of the initiative and to reduce uncertainty for the private sector. Initiatives by agencies such as the Science Foundation Ireland (SFI), Sitra in Finland, the National Research Foundation in Singapore and AOSTRA in Alberta, Canada, have benefited from the availability of multiyear financing and have been able to commit themselves to support R&D and innovation projects and investments which, by nature, only yield returns over the long term. Programme financing should not be spread too thinly; this ensures that the best possible use is made of scarce resources. In such cases, priorities need to be established.

(iii) Co-investment and risk-sharing may boost the efficiency of programmes. Co-participation is assured when the subsidies, credits, venture capital or even the fiscal incentive granted are just a percentage of the cost. Co-financing tends to work best when the projects it supports are relatively close to market activities. Such is the case for the Rural R&D Corporations and the Collaborative Research Centres (CRC) in Australia and the technological programmes for product and process innovation development in Finland and Sweden. In these cases, the investment funds contributed by the State complement the resources contributed by firms and industries for the purposes of a possible commercial application. Basic R&D, which tends to be a more strictly scientific activity, is further removed from profitable market activity and hence State support tends not to involve co-financing.

(iv) The importance of a proactive attitude on the part of agencies. Agencies should not be "passive windows" to be approached by users. The agencies' philosophy in terms of programmes and their structured objectives and goals are such that they seek out clients and provide information and technical assistance for their investment plans. For example, one of the missions of Enterprise Ireland is to proactively identify businesses with potential and offer them a rigorous analysis of their company or project in order to come up with solutions and develop a business plan that maximizes growth and development. Assistance also helps companies to identify government support programmes. Moreover, the agencies' services are often provided free of charge or subsidized in some way.

(v) Demanding responsibility in the negotiation of incentives with transnational corporations. In the Czech Republic, Ireland and Malaysia, agreements are concluded to establish explicitly the conditions and the commitments undertaken by the company and the agency. The agreement establishes the terms under which the subsidies or tax incentives are granted and specifies the obligations of corporations in areas such as investment and job creation. These are long-term agreements (for example, in Ireland, they are for 10 years). In most cases (except Malaysia), the agreement includes a clause that provides for partial refund of the incentives should the investor fail to comply fully.[35] This clause varies according to the type of subsidies provided for in the agreement. A similar criterion is applied in Ireland for FDI incentives to assist SMEs and improve their management. The assistance programmes are divided into various stages, so that fulfilment of the targets can be monitored as a precondition for the next disbursement. The agency itself set up a monitoring system devised for this purpose. An application for disbursement nonetheless generally tends to be processed within two weeks (see box VI.8).

(vi) It is normal for support programmes that entail a certain level of risk to sometimes fail . This is particularly the case in the area of innovation.

(vii) Too much red tape in a programme can deter a company from participating. There must be a balance between rigorous administrative procedures, on the one hand, and promptly responding to a company's application and disbursing funds, on the other.

(viii) The countries that use strong incentives as part of their structurally oriented strategies consider them not so much as subsidies but rather as an investment in the country's growth, which may even bring in returns for the treasury. This point is illustrated in figure VI.14 by the case of Finland. Naturally, the returns depend on sound programme design and management.

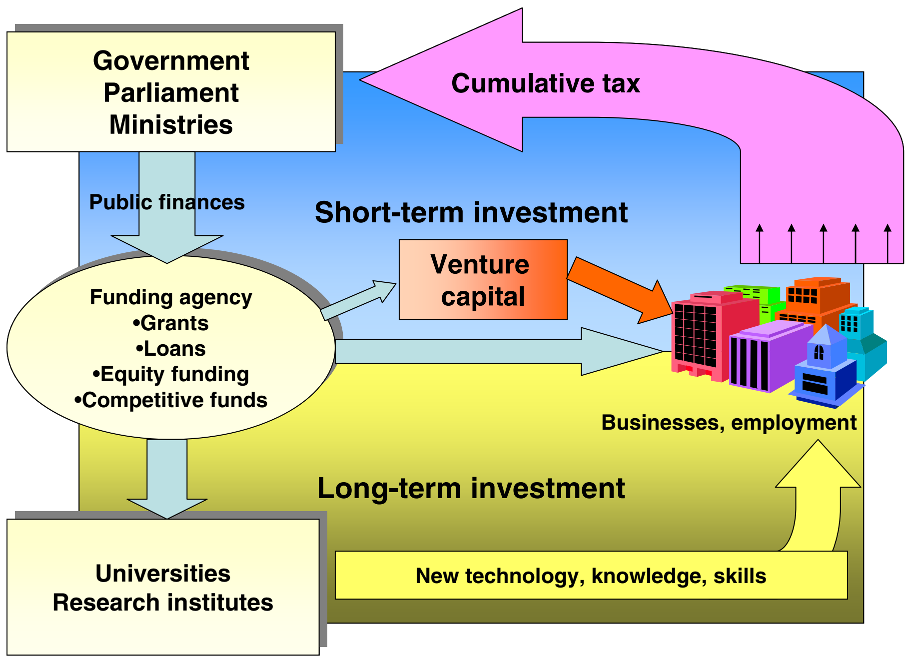
[35] The State is also bound to comply with its obligations.

Box VI.8
ALLOCATION OF FDI INCENTIVES

In Ireland, a cost-benefit model is used to select and determine the incentives granted to a company. The calculation is made over a seven-year period and all public expenditure on FDI attraction is taken into account, including the cost of standardized tax exemptions and administration, plus an estimate of the benefit in terms of increased economic activity resulting from FDI. The benefits are discounted by 50% to take into account the possibility that the investment might have occurred in any event. Recently, special weighting has been applied to FDI in high-technology enterprises. At the beginning of the current decade, the Czech Republic established an Investment Act, which did away with discretionary power in this regard by spelling out the benefits available for FDI. This Act has served as a guide in awarding incentives, except in the case of two large-scale projects. Malaysia, a country recognized for the effectiveness of its FDI-attraction programme, seems to have a relatively high degree of discretionary power in offering incentives.

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

Figure VI.14
THE CYCLE OF RETURN ON INCENTIVES IN FINLAND



Source: H. Kotilainen, "Building Long Term Strategies and Public-Private Alliances for Export Development: The Finnish Case" [online] http://www.cepal.org/comercio/noticias/paginas/7/29947/Kotilainen_Finland_Sevilla.pdf.

(ix) In programme conceptualization and design, it can be useful to have an explicit checklist of points to be covered. Box VI.9 presents an example of this.

Box VI.9

EXAMPLE OF A CHECKLIST FOR PROGRAMME CONCEPTUALIZATION AND DESIGN

Clarity about the nature of the problem to be addressed

Have the objectives been clearly and unambiguously defined, with a view to overcoming a specific constraint?

Additionality

Is it clear that the programme will encourage the desired behaviour, be well received by the designated users and does the scale of the financing match the expected actions and results?

Competition

Does the programme need to be competitive in terms of access? Any answer to this must take into account the capacity to define objectives in terms of social benefits, the ability truly to assess the merits of alternative proposals, administrative costs and users' potential strategic behaviour to obtain preferential treatment.

Consistency

What are the possible interactions with other programmes and how does the programme fit into the overall set of support activities in relation to the identified objective?

Duration

How long will the programme need to continue in order to achieve the objective and produce sustainable results? Is there a natural cycle for the development of the objective or should the programme be introduced in segments? Is there a plan for ending the programme?

Risk calculation

In order to take a calculated risk, is it clear what the risk of programme failure is in relation to the potential benefits? If both the risk and the benefits are considered to be high, it may be better to begin with an experimental programme and, if this proves satisfactory, expand the programme to its full scale on a pilot basis before launching it fully.

Risk management

Have those involved remained alert to possible conflicts with the objectives of other programmes, both within and outside the set of programmes for the export activity being supported? Given the danger of capture by lobby groups, is there an exit plan for shutting down the programme based on its success or failure *vis-à-vis* the objective? One mechanism that can be considered for that purpose is to set a specific programme duration (a sunset clause) that automatically requires an assessment of whether it should be continued or not. Possible abuse of the programme on the part of users must be anticipated, by means including studies of the real behaviour of agents in the market concerned.

Administration

Does the design of the administrative framework match the complexity of the programme and its risks, so as to avoid excessive bureaucratic interference that would discourage its users? Examples of this would include unnecessarily slow processing of requests and disbursement of funds given the amounts involved or the need for timely action. Insofar as accounts or reports are required from those who benefit from the programme, efforts should be made to apply procedures that are familiar to those in the industry.

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of T. Cutler, "Public and private sector alliances for innovation and economic development: the Australian experience", Santiago, Chile, 2008, unpublished.

3. Strategy assessment

Eleventh principle

The effectiveness of strategies is dependent on an assessment of implementation and their impact on the attainment of the objectives set.

In that regard, the former Prime Minister of Singapore, Lee Kuan Yew, has made the following comment on public support policies:

Does it work? Let's try it and if it does work, fine, let's continue it. If it doesn't work, toss it out, try another one (*New York Times*, 2 September 2007).

This may be a good pragmatic philosophy for a proactive and solvent government with medium- and long-term ambitions and strategies for structural change. Nonetheless, in order to be effective, governments must have the capacity to evaluate programmes.

In a large number of the selected countries, there is a structured system for assessing and monitoring strategies from the point of view of the outputs of ministries and agencies. Ireland is one good example. A government monitoring committee has recently been established to monitor implementation of the National Development Plan. The committee meets every six months. In addition, each government department is required to prepare its own three-year strategy for implementing the Plan, as well as a yearly output plan with quantifiable performance indicators. However, outputs are not necessarily synonymous with impact on the attainment of the objectives. Few countries systematically conduct impact assessments in this connection.

Indeed, most governments have only recently begun to pay special attention to the systematic assessment of the impacts of strategies, projects and programmes.[36] Rigorous assessment based on an appropriate methodology and empirical evidence is quite difficult to implement. Consequently, only a few of the challenges can be outlined here.

As Alan Hughes (2007) puts it, it is vital to know what would have happened if public support had not been granted to an activity. One possible methodology for programme assessment is to create control groups, comparing the performance of firms having similar characteristics with that of firms that benefited from the incentive. There is a problem, however: the firms that take advantage of programmes may be the most astute, and without the incentives they would have done well anyway. In order to overcome this potential bias, firms that enter the programme can be modelled in order to help assess its impact, using an econometric exercise with a counterfactual. An alternative is to use a subjective counterfactual, where participating firms are asked what would have happened if they had not made use of the programme. The advantage of this is that participating firms have the greatest amount of information about themselves. A strategy suggested by Hughes (2007) in order to overcome the methodological pros and cons is to combine methodologies. For example, in the case of an innovation programme for SMEs in the United Kingdom, a combination of paired control groups was used, with a selection model, a subjective counterfactual and case studies (a “mixed method”).

Cutler (2008) points to three additional problems. First, in addition to stating goals in a quantifiable way that can be evaluated,[37] a quantity of information and data must be collected on the firm’s performance before and after the support programme. To that end, the programme must —without discouraging participation— require firms to provide a minimum of relevant data on performance when they enter the programme and during a monitoring process, which also has to be organized. Second, some programmes have long-term impacts, which is often the case in the field of innovation; as a result, the monitoring and data collection system may function for as long as 10 or 20 years. Third, better understanding is needed of the complex transmission mechanisms between an activity and its impact on aspects such as productivity, enterprise growth and trade. Other considerations that can be added to those of Hughes and Cutler are the importance of using independent assessments and the need to strike a balance between the quality and benefits of an evaluation and the cost in financial terms and the time spent by officials.

Two countries with a culture of systematic and relatively rigorous evaluation, particularly in the difficult area of innovation, are Finland and Australia. Finland has been cited by OECD for the particular attention it pays to evaluations. For example, its ministries organize (generally independent) expert groups, which may include non-Finnish nationals, to evaluate the programmes of certain sectors or clusters. The Academy of Finland evaluates both research programmes and individual projects, but it now places more emphasis on the former. Programmes are evaluated taking into account the initial conditions and goals and the level of financing, with an analysis of scientific results, impacts and the efficiency of programme administration. Another aspect that is monitored is the implementation of recommendations arising out of the evaluation. The Academy’s

[36] Until recently, multilateral development agencies did not carry out a systematic and rigorous evaluation of the impact of their programmes.

[37] An added example is that Australia’s rural R&D corporations look for a 7:1 cost-benefit return (in impact terms) for their grants programme.

sister agency, TEKES (the Finnish Funding Agency for Technology and Innovation), uses goal-led indicators. There are also evaluations of support bodies. Programme evaluations are used as inputs for the analyses conducted by the Science and Technology Policy Council (STPC) in relation to the national three-year plans. Box VI.10 summarizes the evaluation of an R&D and innovation programme in the field of electronics and telecommunications.

Box VI.10

FINLAND: EVALUATION OF THE ELECTRONICS AND TELECOMMUNICATIONS PROGRAMME

The Finnish Funding Agency for Technology and Innovation (TEKES) provides €247 million in funding per year for technology programmes in strategic areas identified by the agency and the business community. One of the sectors that have benefited is the electronics and telecommunications sector, with three programmes funded between 1997 and 2001: Electronics for the Information Society (ETX), Telecommunications—Creating a Global Village, and the Telectronics Research Programme, the latter funded by the Academy of Finland. These programmes cost a total of €300 million.

All three were the object of a mid-term evaluation. In many respects, the evaluators approved the progress of the projects. However, they questioned the clarity of the programmes in terms of solving problems of particular technical and commercial importance for Finland. When the programmes were concluded, a new evaluation was conducted by a consultant from outside the institution, by two government agencies and peer-expert panels.

The evaluation focused on four issues: the first related to the selection of the strategy and the research portfolio of the three programmes and their relationship with the development needs of the economy of Finland. The second referred to the effects of the programmes and projects on the ICT sector in the country (including the impact on the network and on individual participants). Third, the evaluation turned to the value added by the programmes and the improvements in their administration. Last, the evaluation analysed the way in which the two most industry-oriented programmes had been able to interact with the programme financed by the Academy, which had been of a more scientific nature.

Seven techniques were used to provide answers to these questions:

- Analysis of networks created by the project: the TEKES database was used in mapping relations among firms and between firms and public institutions.
- Interviews with those responsible for various subject areas within projects.
- A review by panels of experts that looked at the administration of the programmes and the functioning of a small group of key projects.
- Strategic interviewing of firms to test programme strategies and examine discrepancies with the expectations of senior executives of firms and corporations.
- Interviewing of project leaders about the functioning of the project and the relationship with companies and public bodies.
- Analysis of self-assessment questionnaires.
- Analysis of foreign programmes, identifying and reviewing the strategies of four programmes in other countries, to compare with the programmes under way.

The first questions were responded to on the basis of a specific group of methodologies, as can be seen in the following table:

ASSESSMENT TECHNIQUES

Verification of objectives	Verification of networks	Interviews with thematic leaders	Peer Review	Strategic interviewing of firms	Interviews at project level	Comparison with foreign programmes
Strategy and portfolio			X	X	X	X
Impacts on ICT sector	X	X	X	X	X	
Impacts on subject areas		X	X	X	X	X
Interaction among programmes	X		X		X	

This set of methods provided a fairly complete view of the programme's impact in the electronics and telecommunications sector in Finland. Not only were responses provided to the aforementioned questions, with a significantly positive impact especially in industry, but a series of recommendations were delivered in relation to the actual administration of programmes and interactions among projects, and the need to internationalize innovation, and increase cooperation between: the agency promoting innovation in businesses, TEKES, and the Academy of Finland.

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of the Finnish Funding Agency for Technology and Information (TEKES), "Evaluation of Finnish R&D programmes in the field of electronics and telecommunications. Technology Programme Report 2/2002" [online] http://www.tekes.fi/julkaisut/RD_Programmes_in_Electronics_and_Tele.pdf, (2002).

Another country active in evaluation, this time in the area of enterprise and export promotion, is New Zealand, which conducts both internal and external evaluations. For example, the various programmes of New Zealand Trade and Enterprise (NZTE) are evaluated externally every three to five years; the agency also has its own assessment unit. The methodology used is a "mixed method"; for example, the evaluation of one programme involved (i) a review of documents and files; (ii) interviews with users and officials; and (iii) three surveys, two administered to user groups and one to a group of non-users. The respondents totalled 3,000.

In Ireland, incentive programmes are justified to the public using cost-benefit analysis ("value for money"). In any case, the ex-post assessment of programme impacts does not yet appear to be particularly systematic. When requested by its ministry, Ireland's national economic development authority, Forfás, which is the coordinating agency for integration with the world economy and export development, can evaluate a programme three to five years after its inception. In its analyses, it combines independent external consultancy with beneficiary interviews; in other words, it uses a mixed method. The other selected countries also conduct, on a relatively ad hoc basis, evaluations with varying levels of rigour.

4. Risk of capture

Twelfth principle

> *Structured public-private alliances representing a diversity of interests, with well-established rules, transparency and evaluation modalities, can minimize the risk of private-sector capture of the government in terms of strategy formulation and implementation.*

As mentioned previously, medium- and long-term structurally oriented strategies can be more effective when developed in the context of an alliance between the public and private sectors. It is, however, essential that the government should work with the private sector in the framework of a public good and not become captured by special interests.

One safeguard can be to prioritize the construction of formal frameworks for primary interaction between the public and private sectors regarding strategies and programmes. The risk of an alliance dominated by informal communication frameworks is that, without parallel control mechanisms, the government may be captured by lobby groups.

Promoting public transparency is another way of preventing capture, but there are practical limitations, depending on the circumstances. For example, while it is effective to publish the cost of an incentive agreed in order to attract an FDI project, it would not be advisable to reveal in real time the content of a negotiation on the subject, or to reveal it ex post, if there will subsequently be a need to negotiate with other businesses. The publication of precise information on, for example, the contributions to the investment project by the foreign company and the government may also encounter practical constraints associated with proprietary information not traditionally considered to be in the public domain. A failure to respect confidentiality in related areas could discourage other firms. This is why TEKES, the Finnish agency for business innovation, performs its own in-house evaluations. To make public a very positive impact assessment on a horizontal subsidy programme to which access is generally available might not be appropriate if it resulted in demand exceeding the available resources, leading to rationing.[38] The advisable degree of transparency in decisions by high-level committees depends on incentives and the institutional framework (Levy, 2007). Nonetheless, despite reservations that may arise depending on the circumstances, transparency is usually an important tool for avoiding the capture of government by special interests.

[38] Effectiveness depends on the rationing system adopted. Adapted from Gavazza and Lizzeri (2007).

Clearly setting out the objectives of an incentive programme, together with appropriate evaluation based on evidence, can minimize the capture of government by industry. This behaviour prevents the continuation of programmes that favour companies that are not yielding satisfactory results. As mentioned earlier, the inclusion of a sunset clause in the incentive programme can avoid such problems.

Rules of conduct for public servants and participants in the public-private alliance are also important.

While Ireland is not the only country to be concerned with the potential risk of capture, its actions are illustrative of certain measures that can be adopted. On the one hand, it has a well-structured formal institutional framework for the public-private alliance, with financial and technical support resources. The private partners (with operational responsibilities) sitting on the boards of directors of the executing agencies that manage the incentives for private businesses are individually appointed by a government minister. They must be highly respected as experts in their fields and not act as representatives of their companies or associations. Appointments rotate over time. The private directors, like all the government officials, sign a code of conduct and the members submit annual declarations of their financial and commercial interests.[39] The private directors receive no documents and take part in no discussions which are directly linked to their own commercial or financial interests. The cost of fees, travel expenses and per diem for the directors appear in the budget published by the agency in its annual report.[40] As would normally be expected, auditing is carried out. The decisions of the board are almost always reached by consensus. Each year, the minister responsible for the agency is required to confirm that all procedures have taken place correctly. Also, agencies in Ireland practice a high degree of transparency in relation to agency operations and incentive programmes.

Lastly, although it is less transparent, Singapore discourages capture through good wage levels, a strong culture of accountability for decision-making among officials in respect of the results of economic development policies, and the existence of an independent anticorruption agency with extensive powers.

D. Relevance of other regions’ experiences for Latin America and the Caribbean

Before drawing conclusions from the analysis of experiences of countries outside the region, it is a good idea to reflect in general upon the strategic approaches behind each of them.

First, the countries all started from different levels of development, had disparate economic structures and were undergoing highly dissimilar moments in their history. What they generally had in common was the firm belief of their economic, social and political stakeholders that, in order to overcome an adverse situation, be it catastrophic backwardness (Ireland) or a sudden turnabout in the political situation (Finland), social, political and economic consensus needed to be built around at least a minimum number of shared objectives. These objectives could be increased and broadened over time and in the meantime would enable the country to attain higher levels of competitiveness and thus improve the well-being and social cohesion of the population.

The formulae and institutional frameworks designed as a result were also highly diverse, but they generally shared the common denominator of favouring negotiation over conflict, inclusion of stakeholders over exclusion, the construction of a shared national project over one catering to partial interests, and a medium- and long-term vision over the pursuit of immediate results.

39 See Forfás, “Code of Conduct” [online] www.forfas.ie/about/howwedobusiness/Forfas_Code of Business_Conduct_Committee_0501_webopt.pdf.
40 Not all the selected countries pay honorariums to private directors.

This type of basic consensus opposes absolute and foundational visions in favour of pluralistic ones that can ensure the continuity of development projects regardless of the changes in political leadership that form part of life in a democracy. In this way, the continuity of both the processes and the function of the public sector in the public-private dialogue are guaranteed even when there is a changeover in the actors involved.

How these consensuses are generated also varies considerably: they may be more implicit than explicit; some may take longer than others to mature; they may be formed through lasting and successful public policies that encourage a strategic convergence with the private sector in the pursuit of shared goals; and they may crystallize into formal institutional agreements between the public and the private sector.

Regardless of these differences, the key component in each case has been the existence of a leadership and a political ethos in favour of cooperation and dialogue among the parties, which makes it possible to define a shared horizon and progress towards sustainable growth and development.

Considering how historically fragile democracy and institutions are in Latin America and the Caribbean, these factors need to be borne in mind when reflecting on the successful experiences of countries from outside the region. Hence, the need to consider the 12 first principles about alliances, strategies and their implementation that were stated earlier and to establish some stylized facts relating to the strengths and limitations of the current situation in the region.

These strengths include the following:

(i) There is much evidence to suggest that Latin America and the Caribbean can build stable consensus around economic strategies. For instance, almost all countries have reached a sustained public consensus on the importance of achieving and maintaining fundamental macroeconomic equilibria. Regardless of political and philosophical orientation, governments recognize that macroeconomic equilibrium must form the backbone of their political programme. Macroeconomic stability has also been shown to be fundamental for countries outside the region that have formulated medium- and long-term strategies for structural change and productivity growth.

(ii) Despite some civil-society anxiety about the manifestations and effects of globalization, there is a large degree of public acceptance about the fact that effective integration into the world economy is essential to achieve growth and structural change. The debate is focused on "how" to achieve integration into the world economy rather than whether to follow that path in the first place.

(iii) Some countries, such as Brazil, Colombia and Costa Rica, have development strategies that include medium- and long-term national plans.

(iv) In certain countries, structural change and competitiveness (as well as export development) occur in a framework of dialogue between the public and private sector. In countries such as Barbados, this framework is firmly institutionalized in the form of a very active national tripartite forum that has some similarities with the NESC in Ireland, while relatively new forums include the Economic and Social Development Council in Brazil and the National Agreement of Peru, which may move in that direction. Public-private collaboration also takes place at the level of certain activities, as is the case with national and regional competitiveness commissions and the export competitiveness agreements in Colombia or the National Competitiveness Council in Peru. While there are countries with no such firm national institutions, they do have subnational (regional) focal points that reflect the potential of alliances and that may provide a good demonstration of how to construct public-private alliances at the national level. One example is the state of Jalisco in Mexico, where the authorities are working with associations in the electronics industry (including multinationals) to increase the sector's competitiveness in export markets. The actions in the state of Jalisco are led by a development plan in the context of an alliance with the private sector. This association is the concrete regional expression of a national SME strategy that is still in the implementation stage.

(v) In some cases, special institutions have been set up to grant more power and coordination capacity to implement strategies. This is the case for the innovation strategy of Argentina. In 2007, the authorities created the Ministry of Science, Technology and Productive Innovation. The creation of this Ministry was the culmination of a process that had taken a qualitative leap forward in 1997, with the introduction of the National Plan for Science, Technology and Innovation under the Science and Technology Cabinet of the Ministry of Education, Science and Technology. In 2002, Colombia adopted law 790 that merged the Ministry or Economic Development and the Ministry of External Trade to create the Ministry of Trade, Industry and Tourism. The new Ministry became the single governing body for economic development, with special emphasis on issues related to competitiveness, integration and development of productive sectors of industry and micro- small and medium-sized enterprises, as well as external trade in services, goods, technology and the promotion of foreign investment.

(vi) Other countries have an organization with a strong capacity for executing and coordinating programmes concerning export promotion, innovation, FDI attraction and/or business competitiveness. Some agencies are set up through special legislation, while others are non-governmental but with strong links to the public sector. An example of the latter is the Costa Rican Coalition for Development Initiatives (CINDE), which is an FDI attraction agency that provides a comprehensive and high-quality service to investors and facilitates partnership between firms, corporations, institutions and the Government.[41]

(vii) There is a wide range of programmes, incentives and instruments to promote exports, production, science and technology. These are implemented by a variety of specialized agencies belonging to different ministries. Although programmes tend to be horizontal, there is an increase in the number of sectoral and regional support programmes and those geared towards specific actors (such as SMEs) or activities. In terms of SMEs, many countries have been developing projects to promote association for innovation, integration into value chains and access to new markets (in clusters, networks or territorial associations), which have often yielded very positive results.[42] Some countries have a specific law to support and develop the competitiveness of micro-, small and medium-sized enterprises and lend continuity to ongoing efforts. This is the case of Mexico, which introduced the law on developing the competitiveness of micro-, small and medium-sized enterprises in 2002. There are also plans to guide the priorities of public support in this and other areas.

Any limitations are usually related to the lack of a long-term integral vision, the absence of active and stable participation from the private sector in various parts of the process and institutional weakness in terms of the basic principles described throughout the chapter. As a result:

(i) Few countries have medium- and long-term integral national strategies focused on structural change and productivity growth. In other words, there is no systematic

[41] CINDE was a pioneer in promoting the investment of INTEL in Costa Rica and the export shift towards electronics, medical equipment and ICTs. The early assistance of the industrial development agency IDA Ireland was helpful in this regard.

[42] See the experience of 11 Latin American countries in Dini, Ferraro and Gasaly (2007).

construction of a proactive vision of the future, in terms of opportunities and the structural restrictions standing in the way of growth.[43] In this sense, national plans can be an expression of ambitions and can prioritize or coordinate the relevant government policies. However, few countries produce such plans and, of those that do, not all of them provide the necessary follow-up or resources to make them an effective indicative exercise.

(ii) There is a shortage of broad and structured dialogue —as part of a genuine public-private alliance— on issues relating to structural change, productivity growth, integration with the world economy and export development with a view to producing a consensual medium- and long-term strategy. Such a lack of dialogue means that any alliances created are either fragmented or represent special interests. It also results in a lack of continuity.

(iii) Even in cases where private-sector participation has increased in decisions on the use of funds and programme execution, the level of coordination and linkages between the public and private sectors is often extremely low. This is partly due to mutual distrust between the two sectors. One major contributing factor is the instability of public institutions and authorities and, in some cases, the low level of technical qualification of public officials. This hampers constructive interaction, as it becomes difficult to forge ties or achieve consensus before a political change sweeps away any progress made. Machinea (2005) refers to the "recasting mania" in Latin America, whereby whoever takes office wants to institute a "new" country that is visibly different from the old one. This is a characteristic practice of young democracies.

(iv) Many countries lack the key entities that could lead the strategy for structural change and productivity growth with the political power, technical skill and institutional means needed to mobilize adequate resources, coordinate and implement a medium-/long-term strategy and become credible partners to the private sector. One consequence of this is a lack of coordination between the programmes and policies that form the foundation for strategies. For instance, export promotion programmes often attach no importance to technology, while innovation programmes fail to consider marketing intelligence and commercialization.[44] Generally speaking, the ministries for foreign affairs that are responsible for export promotion policies have limited links with ministries of science and technology, with the two camps speaking "different languages". Interministerial commissions set up to drive certain policies forward sometimes become so large, with so many representatives, that the agenda is diluted due to an inability to establish priorities. A second consequence is programme sprawl and duplication.

(v) To expand on the above, in some cases there is an uncoordinated range of instruments geared towards the various areas involved in structural change, productivity growth and export development, such as innovation, exports, technical assistance, training, funding, etc. This highlights the disadvantages of not having powerful bodies or mechanisms (such as crossed board representation among agencies) to avoid overlap and facilitate the coordination of actions between public entities. The situation is worse in large countries or those with a decentralized administration.

[43] Machinea (2005, p. 10) emphasizes the need to balance short-term approaches with medium- and long-term ones: "the question of balancing the short and long terms implies that these are mutually opposing positions. The opposition between them is strong when certain short-term decisions distance us from our long-term objectives, and weaker when concerns over short-term decisions divert government's attention away from forming, or at least declaring, a strategic country vision in the form of policies and programs".

[44] The need for a common vision and the implementation of coordinated programmes is demonstrated by a study by the Institute for Applied Economic Research (IPEA) in Brazil, which found technological innovation to be a determining factor in the export capacity of Brazilian firms. Firms that promote innovation are 16% more likely to export than all other firms. See Salermo and De Negri (2005).

The lack of linkages between programmes and institutions also leads to a proliferation of similar instruments often lacking in resources. The net result is a much more limited impact than if efforts were prioritized and coordinated. Two immediate consequences of this are: superficiality, or a lack of more complex programmes to support firms that have overcome initial basic stumbling blocks; and the lack of institutional specialization, which means there is no sustained process of learning and correction.

It is often difficult to find a contact point to provide information on activities carried out by institutions. Each institution has its own programmes and has little knowledge of what others may be doing. This not only implies a loss of an overall vision of the institutions and strategy, but also precludes possible areas of linkage and cooperation, thereby creating confusion for private clients. There are also insufficient activities related to foreign "intelligence" for the development of new institutional arrangements and instruments.

In other cases, the instruments in force reveal the various "archaeological" layers of development policies implemented by successive governments with different visions and the acquired (and sometimes contradictory) rights of their beneficiaries.

(vi) There is insufficient monitoring of programmes and a lack of rigorous and systematic evaluations of their impact.

(vii) A horizontal conception of policies and programmes remains prevalent. This in itself is not negative but must be complemented by a more targeted policy that fulfills medium- and long-term goals of structural change and productivity growth.45 The predominance of horizontal instruments is no coincidence. Most current programmes and instruments were designed in the 1980s and 1990s, when strategies focused on basic reform intended to consolidate macro stability and apply neutral incentives.

(viii) There are several budgetary issues to be considered: (i) there is limited fiscal space in some cases due to the limitations of tax management and, where such space exists, it is not systematically channelled into a strategy for structural change and productivity growth;[46] (ii) although many programmes have an original budgetary allocation, the disbursements needed to move forward with implementation and execution are subject to discretionary political and operational decisions; (iii) the use of resources (execution and results) is insufficiently transparent, which means the business community and civil society lack the information needed to analyse the effectiveness and efficiency of the programmes implemented; and (iv) in many cases, persistent fiscal weakness impinges on the continuity of resources and limits the availability of instruments to short-term actions.

(ix) In terms of innovation, institutions have given more support to scientific development than to applied research and the complete innovation chain (which include important activities for countries behind the world technological frontier). Over the last decade, programmes geared towards firms have been introduced, although these have been lacking in sufficient commercialization support, linkages with a national innovation strategy and international linkages. Added to this is the fact that the level of resources

[45] According to Hausmann and Rodrik (2006), countries that wish to increase value added, technology and productivity are "doomed" to be selective in their choice of industrial development focus. Their paper describes the need to prioritize, mainly due to limited resources. For instance, the only way of being a relevant global player, especially in terms of innovation, is to focus on specific activities and sectors.

[46] As stated previously, the formulation of a strategy for structural change and productivity growth includes identification of the primary constraints on growth, which may involve macro-, meso-, micro- and socio-economic issues, the relative significance of which will depend on the circumstances of each country.

for programmes to encourage private R&D spending tends to be low and relatively unfocused.

(x) Businesses are not used to working together and this discourages associativity. This is apparent in the low levels of confidence between producers and suppliers of inputs, services and equipment. Government must therefore play a more active role in promoting association between agents and possibly provide support and training so that companies of different sizes and sectors can become effective partners in a public-private alliance.

(xi) The professional excellence of public-sector institutions, especially in macroeconomics, is widely acknowledged. However, there is often a lack of professional capacity in ministries and specialized agencies directly responsible for strategies in the real economy.

The list of areas that require work is relatively long. Furthermore, consensus building is, by nature, a slow process of trial and error. Institutional change in this regard is similarly slow. Nonetheless, countries should not delay efforts to initiate social processes that lead to a public-private alliance capable of building public understanding and eventually consensuses regarding strategies and their implementation. Pilot initiatives may be a way of beginning the process of trial and error. However, the region would need to tackle the inertia resulting from the favourable economic conditions of recent years. It is certainly better to make such efforts in a boom period, rather than being forced to do so in leaner times.

Annex

Strategies in selected countries

Australia

In Australia, the First and Second World Wars gave rise to an awareness around self-sufficient development that lasted for several decades. As a result, industrialization and economic diversification gathered pace, with growth based on domestic demand and exports of raw materials. In the mid-1980s, economic instability, a low growth rate and high inflation gave rise to reforms geared towards market liberalization and deregulation, the elimination of protectionism, privatization of public services and the promotion of competitiveness for export development. In the 1990s, the strategy was strengthened by the country's involvement in Asia-Pacific Economic Cooperation (APEC), as well as by initiatives to boost innovation by promoting associativity and collaboration between businesses and academia and the strong public support for national centres of excellence. The last decade has seen the implementation of a series of incentives (some pre-existing) as part of the "Backing Australia's Ability" package of programmes to boost innovation in agroindustry, mining, biotechnology and ICT. A new national strategy based on innovation is now being implemented in 2008 following the election of a labour government.

Czech Republic

Prior to 1989, the Czech Republic was part of the Soviet bloc and had a centrally planned economy. Independence resulted in a loss of traditional markets and suppliers, while economic stagnation and crisis combined with democracy, liberalization and the introduction of market mechanisms. The country's association with the European Union (EU) in 1993, the deepening of market reform and the industrialization strategy based on FDI attraction resulted in an economic recovery characterized by rapid growth. The process leading up to EU membership in 2004 involved the country's fulfillment of economic goals and the resulting implementation of three-year plans that provided a financial framework for the goals in question. Since 1998, the country's focus has gradually become more structural, with emphasis on selective FDI attraction through incentives, local business development and the promotion of a knowledge-based economy. This was reinforced in 2006 with the country's export-oriented strategy based on innovation.

Finland

The industrial development of Finland following the Second World War was partly determined by the rebuilding of the Soviet Union and the trade in primary mining and forestry products with countries of the Council for Mutual Economic Assistance (COMECON). Both factors, along with the high priority given to education, served to strengthen the engineering and metal industries and the mining and forestry clusters. Between the 1970s and the end of the 1980s, Finland's industrial policy was geared towards export development by means of protecting local industry from foreign investment by granting subsidies and carrying out frequent devaluations to boost exports. The crisis in the early 1990s, resulting from the collapse of the Soviet Union, macro disequilibria and unemployment, changed the country's long-term vision and strategy. Finland then embarked wholeheartedly on developing knowledge as an engine for economic growth and changing production patterns. This involved reorienting industrial policy towards innovation by integrating science and technology, further strengthening education, forging closer links between industry and academia and improving the commercialization of innovation and the national system of innovation itself (which is now considered one of the best in the world).

Ireland

Over the last 25 years, Ireland has experienced radical changes to its strategy and growth. The protectionist strategy that had been in force since the 1930s was frequently in crisis throughout the 1960s and 1970s. This, along with the opportunity of joining the European Union, prompted the country to liberalize the economy and draw up plans for the use of various EU development funds. Then, the debt and unemployment crises in the mid-1980s gave way to social partnership agreements that shifted strategy towards structural change based on education and export diversification beyond agricultural products. The first strategic programme was centred on stabilizing the economy and guidelines for growth along with social equality. Once the economy had been stabilized, the strategy became even more focused on education (including higher education) and attracting foreign investment, especially from the United States, for export industrialization. To attract such investment, Ireland made the most of, inter alia, its EU membership, its English-speaking culture, its educated workforce and relatively low wages, and incentives, including the relatively low preferential tax rate. At first, FDI was attracted indiscriminately, although with time attraction became more oriented to higher technology sectors and those with greater value added. Export development therefore became specialized in a few sectors (pharmaceuticals, biotechnology, chemical products and electronics) and in services, while local businesses were later helped by policies aimed at achieving linkages with international export chains.[47] The current strategy drives an aggressive programme of incentives for the development of innovation, the integration of local business into the world economy and the strengthening of production, commercialization and innovation networks.

Malaysia

In the middle of the previous century, Malaysia was an agricultural economy that exported raw materials. There were four stages in its industrialization process. First, an import substitution strategy was in place between 1957 (when the country gained independence) and 1970. That resulted in an industry focused on producing low-technology finished consumer goods. This was followed by an export industrialization strategy, characterized by the creation of free zones, strong incentives to attract multinationals, the elimination of the economy’s protectionist barriers and major tax breaks. Between 1980 and 1985, the growth strategy took on a new direction, with the reintroduction of the import substitution policy, especially to support the heavy industry. The fourth and final phase of industrialization promoted an export revival based on new liberalization and active participation in the Association of South-East Asian Nations (ASEAN) and free trade agreements. Industrial policy was guided by two plans. The first covered the period 1986-1995, via the first Industrial Master Plan, which involves industrialization through investment attraction, privatization of public enterprises, lower tariffs and exchange-rate management. Although this strategy achieved its objectives, it did have structural weaknesses: labour-intensive production was losing competitiveness due to wage increases and the inability to create linkages and use technology. From the mid-1990s, the second Industrial Master Plan included a long-term vision and continuity for development plans. Malaysia is now promoting the internationalization of services, ICT, value added in certain manufacturing exports and the development of a knowledge society

New Zealand

The fall in the prices of raw materials during the crisis of 1930 forced New Zealand to implement an import substitution strategy that remained in place until the mid-1980s. As in Latin America, economic crisis, high inflation and indebtedness prompted economic liberalization, openness and generally speaking the policies associated with the Washington Consensus. New

[47] Compared with Singapore, Ireland was slow to recognize the need to combine FDI-attraction policies with programmes to integrate local businesses into the world economy (see Ruane and Ugur, 2006).

Zealand is also active in the APEC free trade initiative. Modest growth at the end of the 1990s, the increasingly worrying low level of productivity (below the OECD average), the deterioration of the social situation, a current account deficit and disequilibria pushed the country to seek a new, more pragmatic growth strategy that combined elements of the market with public-sector interventions. This strategy aimed for structural change and productivity growth, together with innovative, sustainable and integrative export development. In 2002, the framework was established for the strategy "Growing an Innovative New Zealand", which ran into problems at the implementation stage due to a weak underlying alliance. In 2005, a fresh effort was made to reformulate the strategy as "Economic Transformation", around which consensus is still being built to move forward over the next 10 years.

Republic of Korea

The aftermath of war in Korea left the country devastated and dependent on economic aid from the United States to rebuild the nation. Five-year economic development plans began to be implemented in the 1960s. The first plans emphasized industrialization based on protecting local industry and restricting foreign direct investment (FDI), while promoting exports and developing the chaebols (industrial conglomerates) and their trading companies. The model was a reflection of many of the policies of post-war Japan. In the early 1980s, external debt and inflationary pressure prompted the country to implement a five-year stabilization plan based on gradual market liberalization. At the end of the 1980s, once chaebols were more economically independent and technological prowess was on the rise, the country began to focus on innovation, with a five-year plan that continued to liberalize markets and limit public support actions. At the same time, the country joined OECD and continued to open up the economy. The new millennium saw the beginning of competition with China and an appreciating exchange rate, which forced the country to focus on developing an economy based on innovation, knowledge and internationalization. All of this was particularly relevant to SMEs, which had previously been in the shadow of the chaebols. More recently, the strategy has included the negotiation of free trade agreements (the first of which was signed with Chile).

Singapore

The country's separation from Malaysia in 1965, along with the announcement of the withdrawal of British forces in 1967, accelerated the search for an alternative development model that was not dependent on the small domestic market. The Government therefore gathered together business and union representatives. The focus of the resulting strategy for the next 40 years was an open economy, social stability and a vigorous FDI-attraction policy with comprehensive incentives, a population with English language skills and (initially) low salaries, an English-style legal system and a strategic geographical position in Asia. In the light of competition from countries with a lower-wage workforce, the Government adjusted its strategy from one of indiscriminate FDI attraction towards activities with higher levels of value and knowledge. In the 1980s, this gave rise to the development of electronics, information technology and new service clusters, in which local businesses integrated with international value chains and/or served as suppliers to multinational corporations. In the 1990s, the country pushed forward with internationalization, including participation in the Association of South-East Asian Nations (ASEAN) and Asia-Pacific Economic Cooperation (APEC) and free trade agreements. At the same time, the strategic orientation has moved to higher education and innovation, especially in the areas of biotechnology, electronics, environmental industries and global business promotion.

Spain

Between the end of the Second World War and the end of the 1970s, Spain was governed by a centralist State with a fairly inward-oriented and protectionist approach. The advent of democracy brought about two economic changes that had a profound effect on the country's economic system. First, in 1986 Spain joined the European Union, which meant that the country had to adopt collective EU policies that resulted in the following reforms: modernization of the economic structure, market liberalization and elimination of monopolies, privatization of public enterprises and a reduced public-sector role in the economy. This combined with a substantial rise in promotion instruments and in the financial resources allocated to that end. Second, Spain went from being a centralist country to a quasi-federal State where the Autonomous Communities have been legally awarded considerable power in terms of economic promotion, FDI attraction and SME support, including the integration of local businesses into the world economy. Over the last 20 years, the strategy has varied from an export-promotion focus to one of FDI attraction and international integration of local business. Following EU guidelines, the current strategy is focusing on innovation.

Sweden

Between 1870 and 1970, Sweden was the second fastest growing country in the world, with a strong vocation for educating its population. Growth subsequently came to a standstill for 30 years. During the first period of industrialization, growth was spearheaded by forestry (cellulose and paper) and mining. The country's strategy (which was protectionist at first) enabled the technology of its processes to be enhanced, while differentiating and adding value to its natural resources. Technology that was initially imported was then developed domestically, through a process that culminated in a much more diversified economic structure. Such development was based on the export orientation of industry, the use of export income for technological development and industry, development resulting from government procurement, a constant effort to improve the education and health of the population, a permanent drive to reduce costs through mechanization, process automatization and incremental innovation —all led by major Swedish transnational corporations competing in mainly mid-technology markets. In around the mid-1970s, the protectionist policy against foreign investment was toned down and the development of ICT and electronics began. In the 1990s, strategy focused on joining the European Union and the knowledge society. Innovation strategy became the focus of the policy for structural change and productivity growth, the national innovation system was strengthened and the development of the chemical, pharmaceutical and biotechnology sectors was promoted. Start-ups have also been promoted more recently.

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Chapter VII

Concluding remarks

The Latin American and Caribbean region's recent development process bears witness to its success in taking advantage of favourable trends in the external economic environment that have been reflected in stronger demand, greater liquidity on financial markets, higher commodity prices and larger flows of remittances. Although the region has grown less than other developing economies, by the end of 2008 it will have completed a five-year growth cycle marked by an average annual increase in per capita GDP of 3.5%. In fact, these last five years have been the strongest, longest-lasting period of expansion since the second half of the 1960s.

There are some bright lights in the Latin American and Caribbean development process

The growth experienced during these years has also been of greater quality as measured by numerous economic and social indicators. The region has become less vulnerable to external shocks, as the improved management of fiscal and external accounts has resulted in lower public and external debt levels relative to GDP and higher international reserves. Export growth over the past 20 years has enabled the region to regain part of the share of global trade that it had lost during the three preceding decades. Foreign direct investment reached record levels in 2007, and both unemployment and poverty —although still too high— have decreased markedly. And last, but certainly not least, the region has strengthened its democracies and gained greater political autonomy, as is attested to by the existence of governments spanning a considerable range of the political spectrum.

But there are some shadows as well

The region has yet to make significant progress in bringing about structural change, however. First of all, today, just as ECLAC pointed out 20 years ago in its proposal for changing production patterns with social equity (ECLAC, 1990), inequity in income distribution and, more generally, in access to various types of assets remains an undeniable part of reality in Latin America and the Caribbean. Second, even though in the past few years investment has risen to its highest levels since 1980, it is still not high enough to sustain growth rates above 5%. Third, increased export diversification has not reduced the region's excessive dependence on traditional exports, nor has it resulted, on the whole, in the incorporation of more knowledge or more value added into economic activities or production chains. By the same token, increased exports of manufactures, particularly those covered by special regimes, have not enabled the region to upgrade to production activities and sectors that would deepen, diffuse and accelerate technological learning processes. Fourth, the region's share of global trade in services has been shrinking, and the decrease is particularly marked in the most dynamic segments (informatics, engineering, R&D and telecommunications). Fifth, efforts in the area of innovation remain few and far between and are of limited effectiveness. And these gaps are continuing to widen as developing Asian countries undertake mounting public and private efforts to engage in R&D in the basic and applied sciences and to increase their access to knowledge markets.

Finally, although some spontaneous regional integration can be observed, formal processes (with some exceptions in Central America and the Caribbean) continue to exhibit shortcomings and a lack of dynamism. The list goes on, but the important point is that, even during the remarkable external boom now being experienced and despite substantial achievements on the internal front, the region does not seem to be making sufficient progress in dealing with the challenges associated with the far-reaching changes being brought about by the globalization process.

Limited progress in a number of these areas at the level of the region as a whole does not, however, necessarily signal the absence of advances in some countries, activities and businesses. Inroads have in fact been made, and some of the achievements that are analysed in this study constitute a platform for efforts to overcome certain sources of inertia and lay the foundations for sustainable development in conjunction with increased competitiveness and social equity.

Changes in the global economy

The good news is that, even though the slowdown in the pace of world economic growth will undoubtedly have an impact on some countries of the region in 2008 and perhaps part of 2009 as well, the external environment will remain favourable over the medium term. The incorporation of a large part of the world population into modern economic activities will, in particular, translate into an increase in per capita income and will continue to generate an enormous amount of varying types of demand. High levels of per capita income in the developed world and its growing concentration in most countries, combined with increasingly varied interests, trends, lifestyles, tastes and consumption patterns, are diversifying and stratifying the structure of consumption, which in turn is leading to the formation of extremely specialized, high-end consumer niches.

From the standpoint of technological inroads, sweeping changes have already occurred and others are in the offing. These transformations are associated not only with a broader diffusion of the ICT paradigm but also with the development and spread of biotechnology, which will inevitably bring about profound changes in the structure and patterns of production and services. Other general-purpose technologies, such as nanotechnology, together with new materials and new renewable energy sources, can also be expected to trigger major innovations in processes, products and business models.

All these technologies are converging and have the capacity to alter or reshape the trajectories of a wide array of sectors. Regardless of how a country has managed to position itself within the global economy, its future performance will increasingly depend on its capacity to creatively absorb the new techno-economic paradigms. If these windows of opportunity are to be taken advantage of, however, a huge internal effort will have to be made on the technological front to gradually shift production patterns and structure towards activities that are more promising in terms of the generation and propagation of innovation. Then, as the pioneers of economic development pointed out early on, technical progress and structural change will be able to create the desired synergies.

Openings for competitiveness in the context of heterogeneous learning patterns in and across sectors

The region is currently facing the most favourable situation it has seen in 30 years. Long-standing structural problems persist, however, and the new opportunities for learning, innovation and technological capacity-building need to be seized. What then are the current and potential openings for competitiveness that the region could take advantage of in the face of growing market segmentation and the emergence of new techno-economic paradigms? The diversification and cultivation of spheres in which technological learning and competitiveness come together should constitute the nucleus of any development strategy from now on. There is always room for improvement in almost any area, and new paths are always waiting to be explored. There seem to be two fundamental lines of action that need to be pursued: the first consists of fostering a culture of innovation whereby opportunities are created and the ensuing benefits reaped without having to journey down the roads taken by others; the second entails detecting and seizing the opportunities that are presenting themselves around the globe and learning from the experiences and progress made by other regions.

Global growth needs to be used to bring about the structural changes and productivity growth that will enable the countries of the region to add value and knowledge to their products and thereby broaden and modify their traditional modes of integration with the international economy. The innovation survey results analysed in this volume suggest that the relationship between exports and innovation in Latin American enterprises is a positive one.

The heterogeneity of learning patterns at the sector and company level must be taken into account when seeking to identify openings for improving competitiveness. In some instances, an already-existing competitive base can used to speed up learning processes, boost advantages and explore new opportunities. This volume, in addition to offering an overall appraisal of the production apparatus, analyses four sectors from this viewpoint: manufacturing industry (both traditional manufacturing and manufacturing linked to special export regimes), the agrifood complex, mining and services.

Manufacturing: the industries left as a legacy of the import-substitution process

There is an opening for developing competitiveness on two main fronts in the mid- and high-tech sectors. The first is found in the sectors left over from the days of the import-substitution industrialization model that were completely overhauled in the 1990s in the wake of economic opening. Many of these industries not only managed to survive but are now successfully penetrating international markets. Although their exports account for only a modest proportion of the region's total exports, these sectors have built up a combination of competitiveness and capacity that could be further cultivated and expanded.

In nearly every country in the region, manufactures account for significantly larger proportions of total exports to other Latin American and Caribbean countries than to international markets as a whole. Intraregional trade is therefore hugely important as an engine for export growth. This virtuous dynamic is being driven by the combination of domestic efforts with regional integration processes that are finally coming to fruition and have created training and learning opportunities to expand exports of manufactures, including, in some cases, those incorporating higher levels of technology.

Manufacturing: the industries linked to special export regimes

The second sector in which there is an opportunity to improve competitiveness is linked to the traditional manufacturing industry but operates under a number of different export promotion schemes, such as maquila, free zone, inward processing or temporary import regimes. This sector comprises the export-oriented manufacturing industries of Mexico, Central America and the Dominican Republic, whose advantages include the savings generated by geographical proximity to the United States market, the abundant supply of low-cost labour, preferential access for products to certain markets and tax incentives for investment in productive activities. China and other Asian countries are nevertheless posing increasingly fierce competition, especially in the textiles and clothing segments, and upgrading in the global value chains is slow at best. Moreover, efforts to generate higher value added production processes and establish production linkages have met with little success.

In certain segments and niches of the textiles and apparel, automotive and autoparts, and electronics industries (the number of which has recently increased), however, new organization models for production are being tried out, and concerted efforts are being made to develop and consolidate the supply base and increase interaction with the agencies that promote technology and productivity. Despite a certain number of notable successes in this respect, which indicate the considerable potential for development in this sector, in most instances, no long-term strategy has been drawn up to synchronize skills development and gradually transform labour-intensive manufacturing operations into manufacturing and services clusters that incorporate engineering-intensive product redesign and process automation into their activities.

The agrifood complex

For many countries of Latin America and the Caribbean, the agrifood complex has a tremendous potential to become highly competitive, and technology learning processes could open up possibilities for carrying out more complex production activities in the future. There are numerous opportunities, which have still not been fully explored, for developing forward linkages that would incorporate new products and activities into the agrifood value chains in the region. As the experience of several of today's developed countries shows, there are also huge opportunities for developing backward linkages in the generation of farm inputs (machinery, seeds, agrochemicals, technical assistance) through connections with industries using cutting-edge technology. The transition towards producing goods with greater value added does not necessarily entail increasing the level of industrial processing, but it does require a higher knowledge and innovation content, not only as regards raw materials of agricultural origin, but also in the other stages of the agrifood complex, including logistics and marketing.

The latest technological paradigms, especially biotechnology and, as a complement to this, ICTs, have been substantially altered the technological potential of the agrifood complex. The application of breakthroughs in these fields to the growing of virus-free tissues, genetically modified seeds, the molecular diagnosis of plant and animal diseases, embryo transfers in livestock, the use of genomes to identify and transfer genes that carry desirable traits (for example, resistance to pests and disease and to hydric and temperature stress) has given rise to important innovations in products and processes.

Most of these technological advances arose within a limited group of research centres, universities and large companies in developed countries, and the respective technologies are not spontaneously transferred. Complementary local learning efforts are needed for several reasons: one is that genetic alterations in plants and animals generate responses and performances that are highly sensitive to the particularities of soil and climate. As there is no single response, the adaptations made in each country are key complementary assets: without them, imported technology will simply not yield the desired results. Something similar happens when biotechnology is applied to food production and to the development of vaccines and livestock breeding. Also, importantly, local learning processes and the development of local technological capacities are driven and accelerated by complementary capacities that already exist thanks to the technological, productive and commercial base previously developed in the region.

Mining

Several countries in the region are major players in international mining markets and, in many cases, local capacities have been generated, especially in certain niches. Technology learning in the sector is not limited to the large mining companies; there is a whole network of suppliers and service companies that are taking advantage of technological breakthroughs and benefiting from rising demand in the sector. In order to penetrate higher-tech segments, however, public policies are needed to help companies increase their capacity to carry out more high-tech mineral and metallurgical exploration and mining activities, such as remote sensing by satellite, geophysical drilling, data processing and deposit imaging, using more sophisticated drilling equipment, solvent extraction and bioleaching. The current efforts of some of the region's mining companies to expand internationally to secure markets, to participate in structural changes that generate higher value added, and to acquire marketing channels in developed countries and some emerging economies will also play an important role in improving the sector's performance.

Tourism

Finally, this volume identifies two segments of the services sector as posing interesting opportunities for improving competitiveness and learning processes in the region: tourism and business services. Several countries have undertaken ambitious projects to diversify and personalize their tourism products and thus increase the benefits reaped from the resources they have in this sector. Some, particularly in the Caribbean Basin, have been able to add value by moving beyond the mass tourism of resorts and cruises into niche tourism —for example, by taking advantage of Carnival and sporting events, offering luxury yachting holidays and developing ecotourism and cultural tourism— and by attracting foreign direct investment from international hotel chains and tourism operators. These changes were introduced at a time when the region was losing ground in the international tourism market, although marked contrasts were to be observed among Mexico, South America, Central America and the Caribbean. In order to take advantage of the openings currently available, the public and private sectors need to make a concerted effort to constantly reinvent and diversify tourism as a product and strengthen the sector's links with each local economy.

Business services

The region has made some inroads in business services but has not managed to capture a significant part of a sector that is generally expanding rapidly within the international trade in services. The experiences of the few companies in the region that have been relatively successful at penetrating the business services export market show that amassing the necessary capacity takes time, especially if the goal is to progress beyond simple operations that require little more than cheap, moderately-skilled labour (such as call centres and shared service centres). Some examples of relatively successful export penetration in the area of business services are illustrative in this respect. It was only after building up knowledge by serving first the local market and then selling services to neighbouring countries that engineering and construction companies in the region were able to eventually penetrate the global services market. The new clinical research companies and exporters of informatics programs and services had to go through similar processes. In the case of clinical research, companies are still participating in the less knowledge-intensive stages of the value chain, but even these require access to a pool of internationally recognized biomedical professionals and institutions. Though by no means widespread, notable progress is also being made by certain advertising companies in the region in the wake of the numerous awards and distinctions they have won in international advertising competitions over the years.

Global value chains and the appropriation of rents

To return to the general outlook, it should be noted that many of the aforementioned production activities are part of, and depend on, the organization of global value chains or global production networks. How these chains are governed determines the possibility and capacity for upgrading towards higher value added activities. In general, the entities governing the chains dominate the channels of production, the commercialization process and financing. They also keep design and R&D activities in-house as part of their core competencies. This is why, in many cases, the knowledge that would allow local companies to upgrade and access new sources of income is never transferred and why the rents generated by technological progress are still concentrated in the hands of the developed economies, as Prebisch pointed out in another context some 60 years ago.

The analysis presented in this volume shows that the region has not made huge strides in improving the quality of its exports, especially compared to the developing Asian countries. Export prices, which reflect quality, indicate that the region sells similar manufactures to those produced by the developed countries, but at lower prices. Price differences are greater in the case of mid and high-tech products than in natural-resource-based products, but they are hardly insignificant in the case of the latter (27%). These differences have persisted over time and reflect the minimal innovation efforts under way in the region. They also highlight, however, the potential there is for adding value by improving the quality of the region’s current exports.

Upgrading in global value chains: the strategic role of developing capacities

The task is by no means an easy one as competition, especially from the developing Asian countries, is increasingly fierce. There are, however, three reasons to be relatively optimistic. First, production is becoming increasingly fragmented and modulized and demand is expected to rise dramatically in the next few years. Also, new niches of demand are emerging, as are cross-cutting technologies, many of which need to be adapted to the particular features of each country. Second, the countries of the region have already developed some technological capacities, in many cases, in specific sectors and within certain companies. These need to be exploited and consolidated and used to gain ground in international markets. Third, the experience of several Asian countries in the past few decades shows that upgrading in existing value chains, creating new chains, and developing a tight network of small and medium-sized enterprises around these chains are real and plausible possibilities.

As the experience of several Asian countries has also shown, however, the possibilities of entering into and advancing along value chains depends, more than on their particular characteristics, on the technological capacities that countries manage to build in different production sectors. Learning processes, consequently, play a pivotal role in the process, which is by no means spontaneous and requires the support of deliberate efforts to develop capacities and public policies designed in cooperation with the private sector.

The validity of open regionalism

The fragmentation of production and the hypersegmentation of global markets have been accompanied by the consolidation of regional integration processes. It is therefore essential, as ECLAC has maintained on numerous occasions, to deepen the regional integration of Latin America and the Caribbean, especially since intraregional trade actually encourages export diversification, favours small and medium-sized enterprises and comprises higher value added products than exports to the rest of the world. The regional framework should also promote the development of regional production chains and boost and propagate innovation. For this occur, existing integration schemes need to be deepened and extended to cover new areas (such as services, government procurement, infrastructure and research in specific fields) and the institutional framework needs to be improved by establishing clear rules, and broader mechanisms need to be created. This in turn needs to be achieved within a context that acknowledges existing asymmetries in the region and establishes compensatory mechanisms for relatively less developed countries. The integration of the economies of the region will improve its negotiating position in the international arena where barriers to all kinds of agricultural products have been erected, including tariff escalation in developed countries and the new emerging Asian economies. In short, the deepening of regional integration in Latin America and the Caribbean would strengthen the region's position in the global economy. Short-term interests therefore need to be set aside. At the current pace of global change, today's opportunities may slip through the region's hands if action is not taken soon enough.

The value of strategies that promote structural change and the development of the export sector

Bringing about structural changes with a view to increasing productivity and generating high growth rates as outlined above requires significant efforts to anticipate and identify opportunities, establish realistic goals, and design public policies accordingly. In other words, countries need to implement a medium- and long-term strategy that reflects national interests. Few countries have been able to sustain a process of income convergence with the more developed countries without pursuing a comprehensive strategy of structural change and integration with international markets, and several have drawn up formal national plans in this regard. These strategies award priority to certain "fundamentals", such as macroeconomic stability, fiscal strength, investment, education and infrastructure and combine them with proactive measures to identify not only opportunities but also the restrictions that need to be overcome. The foundations are thus laid for the policies and programmes implemented at the meso- and microeconomic levels to induce the necessary structural changes, with special emphasis on innovation.

These medium- and long-term strategies, which have been a common feature of the success stories, have been missing, at least in the last few decades, from the region's development agenda. The formulation and implementation of these kinds of strategies constitutes the first of the 12 principles derived from the analysis of experiences outside the region that reflect positive results in terms of structural changes and productivity growth, increasing international economic integration and narrowing the income gap with the richest countries of the world.

Public-private alliances

The second principle is that strategies are sounder, inclusive, sustainable over time, yet flexible if they are the outcome of a public-private alliance rather than of a bureaucratic exercise that imposes a certain vision without consulting other sectors. Provided that they are backed by solid political leadership and appropriate institutional arrangements, these kinds of alliances can form the cornerstone for building the level of consensus needed to ensure that development strategies are sustained over political cycles.

Efficient implementation of plans and programmes

The other principles derived from the observation of successful experiences in other regions refer to the operational aspects of the implementation and evaluation of development strategies, such as entrusting the management of the strategy to the ministries and specialized agencies in charge of the real sectors of the economy. This management must be endowed with the necessary political power, technical capacity and credibility to handle and mobilize sufficient resources from the national budget and to set up the support programmes needed to carry out the strategy.

Another principle consists of ensuring the support of specialized public agencies in priority areas and establishing mechanisms to guarantee coordination and cooperation among them. Specialized agencies also need to have a stable, capable and high-level technical and professional staff that has the credibility to work with the private sector on the implementation of national development strategies. The quality of the teams working at the central banks and ministries of finance in the region needs to be matched in the rest of the public sector so that it can apply the measures needed to bring about structural change and productivity growth. This will require major reforms in the recruitment and contracting of civil servants and to the wage policies applied in the public sector.

Learning from —rather than copying— experiences

No attempt is made here either to prove the links between these principles and positive outcomes or to suggest their indiscriminate application. The complexity of the development process and the singular cultural, political, institutional and historic contexts of the experiences studied make it impossible to transplant institutions and processes from one situation to another without making adjustments for local conditions. The formulation of the principles drawn from the various experiences aims, however, to abstract from the specificity of individual practices and institutions. This generic approach, combined with the analysis of concrete practices in cases that have produced good results, calls for reflection on how important the 12 principles may be for each country in the region, bearing in mind the adjustments that must be made for local conditions.

The need to focus efforts

The items on each country's development agenda will depend on its specific situation, but they must include factors that, to a greater or lesser extent, are present in all countries and have invariably limited economic growth, structural change and improvements in productivity in the region. These include a macroeconomic situation that is conducive to growth, innovation (in the broadest sense of the term), the quality of education in general and technical education in particular, as well as infrastructure, business initiatives and the quality of public institutions. Given that resources are scarce, efforts undertaken in each of these areas need to focus on the main lines of action of the development strategy.

Public policies and innovation

The need for public policies to drive the necessary changes in these areas has been stressed throughout this volume, but the importance of these policies for innovation in the region cannot be overstated. In addition to the usual argument about the gap between the social and private benefits of innovation, the stage of development the region is currently at and the characteristics of its production structure need to be taken into consideration. First, although in most developed countries today, private-sector activities account for about two thirds of national innovation efforts, the situation was almost the reverse a few decades ago. This means that public policies were instrumental in unleashing innovation. Second, the possibilities for incorporating technical progress into natural resources are expanding, but the incentives for innovation in this area are not, on the whole, on a par with those for innovation in medium- and high-tech goods where failure to innovate can rapidly result in a marked loss of market share. It therefore comes as no surprise that in the more natural-resource-intensive developed economies, public contributions account for over 50% of innovation efforts. It should also be borne in mind that innovations inside the technology frontier are by no means easily appropriated, and enterprises need to be encouraged to upgrade in the value chains. Given the stage of development the Latin American and Caribbean region has reached and the importance of natural resources in its production structure, the public sector has an even larger role to play in promoting innovation.

Building national consensuses

Development strategies should form part of the search for broader consensuses whose core objective is to attain the levels of equity and social cohesion needed to advance towards the full exercise of citizenship in the region. More cohesive societies can build more solid strategies and institutions and generate the confidence needed for the implementation of essential reforms because citizens in such societies are more willing to accept short-term losses in the belief that these will be more than compensated by long-term gains.

Financing structural change and productivity growth with social equity

Strategies that pursue structural change and productivity growth as well as social equity require financing so that the necessary policies can be implemented. As has been stated on repeated occasions, the region needs to redouble its efforts to increase fiscal resources. In some of the region's countries, the current international context has given rise to a strong conviction that the increase in rents associated with rising commodities prices could generate the financing needed for structural change, productivity growth and increased social equity. Two challenges need to be overcome in this respect, however: the first is how to attain this goal without eliminating incentives to exploit natural resources, i.e., without discouraging private investment in these sectors. Maintaining a balance is therefore of primary importance. The second challenge consists of deciding not only where to invest, but also how. Policy decisions must therefore be guided by the priorities set under the development strategy. As the success stories show, policies are effective when their implementation and impact are systematically assessed in light of their established goals. Also, in order to avert the danger of the process being "captured" by any one group or groups in particular, the public-private alliances in each country must represent diverse interests and function according to clear rules that ensure transparency in decision-making and all other procedures.

Can the countries of the region fill the empty box?

Moving forward with the process of structural change and productivity growth by combining economic and social policies based on the three pillars of technical progress, productive employment and the accumulation of human capital will almost certainly bring the region closer to attaining the goal of filling the "empty box" of growth with social equity, as proposed by ECLAC almost 20 years ago.

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